OEMAX™ CONTROLS

Maximum Value for OEMs℠

NX70 High-speed Counters (NX70-HSC1, NX70-HSC2)

User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will OE Max Controls be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, OE Max Controls cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by OE Max Controls with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING

Identifies information about practices or circumstances which may lead to serious personal injury or death, property damage, or economic loss.

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

ATTENTION

Identifies information about practices or circumstances that can lead to minor personal injury, property damage, economic loss, or product malfunction. However, depending on the situation, failure to follow the directions accompanying this symbol may also lead to serious consequences.

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Precaution for Wiring 75

Safety Instructions

Please read this manual and the related documentation thoroughly and familiarize yourself with product information, safety instructions and other directions before installing, operating, performing inspection and preventive maintenance. Make sure to follow the directions correctly to ensure normal operation of the product and your safety.

WARNING

- If this product is used in a situation that may cause personal injury and/or significant product damage, implement safe measures such as use of fault-safe equipment.
- Do not use this product under any conditions exposed to explosive gases. It may cause an explosion.

ATTENTION

- Make sure to use an external device when configuring the protective circuit breakers for emergencies or interlock circuits.
- Fasten the terminal screws tightly to ensure that the cable connection is secure. Incorrect cable connection may cause overheating and product malfunction.
- Operate and keep the product under the allowed conditions directed in product specifications. Otherwise it may cause overheating and product malfunction.
- Do not disassemble or remodel the product. Otherwise it may cause an electric shock or malfunction.
- Do not touch the terminals when the power is on. Otherwise it may cause an electric shock.

Do not install your high speed counter module if any of the following conditions are present:

ATTENTION

Do not install your high speed counter module if any of the following conditions are present:

- Ambient temperature outside the range of 0 to 55 °C (32 to 131 °F).
- Direct sunlight.
- Humidity outside the range of 30% to 85% (non-condensing).
- Chemicals that may affect electronic parts.
- Excessive or conductive dust, or salinity.
- High voltage, strong magnetic fields, or strong electromagnetic influences.
- Direct impact and excessive vibration.

ATTENTION

Installing Modules on the System

1. Wire I/O cables to the terminal block of High-speed Counter (NX70-HSC1, NX70-HSC2).
2. Turn on the power connected to the High-speed Counter (NX70-HSC1, NX70-HSC2).
3. Turn on the main PLC power.

ATTENTION

Removing Modules from the System

1. Turn off the main PLC power.
2. Turn off the power connected to the High-speed Counter (NX70-HSC1, NX70-HSC2) I/O.
3. Remove the wirings from the terminal block.

ATTENTION

Preventing PLC System Malfunctions

- Use an isolation transformer and line filter on the incoming power to the PLC when there is equipment using or producing high current, high voltage, or large magnetic fields in the vicinity.
- Separate the main system groundings and other device groundings, and use 3-way grounding.
- Do not exceed the current and power rating of the external 24 VDC provided by the PLC power supply. Otherwise it may cause operation errors.
- Avoid system faults due to programming errors by reading and fully understanding the PLC instructions set.
- Perform regular preventive maintenance on installed systems, checking devices and wiring for potential breakdowns and failures.

Precautions for High-speed Counter Unit Operation

When input devices like rotary encoder to High-speed Counter, or under conditions with much noise, select “Phase differential input, 4 x” input mode.

1

Specifications and Components

100Kcps High-speed Counter and 40KHz pulse output function, combined with motor drive, enables temporary location control. (High-speed Counter input and pulse output functions)

(Note) There is no pulse output function for 2CH type (NX70-HSC2) product

NX70 High-speed Counter Unit
NX70-HSC1: 1CH Unit

High-speed Counter Unit Features

NX70 PLC High-speed Counter (1CH type, NX70-HSC1) unit provides 40KHz pulse, as 100Kcps High-speed Counter input, and combined with motor drive, enables temporary location control. (High-speed Counter input and pulse output functions)

1. 100kcps High-Speed Response
   High-speed response of 100kcps allows for high-accuracy speed control and location decision control.

2. Various Input Modes
   Phase differential input mode (1 x, 4 x mode) that can count two-phase pulse of rotary encoder, individual input mode, and direction discrimination input mode are provided. (Select with DIP switch on the bottom of the unit.)

3. Wide Counting Range
   Counting range, formatted as 24-bit signed (binary) integer, covers from -16,777,216 to 16,777,215.

4. Easy to Monitor Counter Measurement and Set Data
   Built-in shared memory helps data read/write at PLC freely.

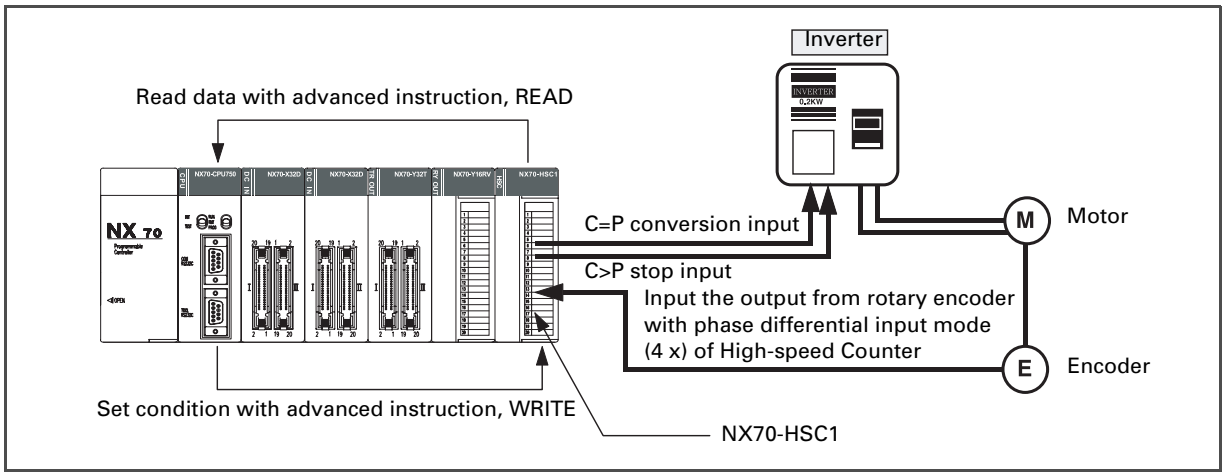
5. Combined with Pulse Motor Drive, Location Decision Control Enabled
   Pulse output for pulse motor and servo motor exists. Adjustment from maximum frequency (40KHZ) to minimum frequency (200HZ) and 2-step shift are all enabled.
   Simple motor control and location decision control are enabled by pulse and servo motor combined. Frequency of each pulse output and shift time setting from high-frequency pulse to low-frequency pulse can be easily done with external volume adjustment.

6. Comparison Output, Counter Input, Pulse Output Enabled
   For output, functions like coincidence output of set value and counter value, zero value output, count over output, and comparison output (C=P, C>P) are provided. For input, functions like counter reset, each input of INH, SUB for pulse output control, and zero input are provided. These functions can be controlled not only from PLC but also from outside.

NX70-HSC1 (High-speed Counter 1CH) Application Example

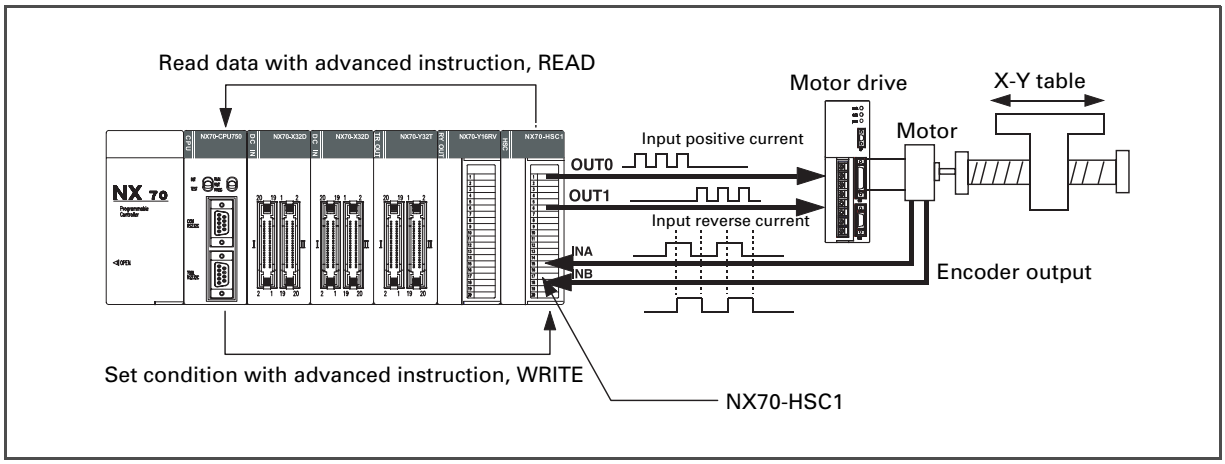
High-speed Counter Function

Count rotation from encoder output and compare the rotation number with set rotation count, and send instructions like conversion or stop to inverter.



Pulse Output Function

Control motor drive with two pulse outputs, and count motor rotation and control it.



General Specifications

Item		Specifications
Temperature	Operating	0 °C to +55 °C (32 °F to 131 °F)
	Storage	-25 °C to +70 °C (-13 °F to 158 °F)
Humidity	Operating	30 to 85% RH (Non-condensing)
	Storage	30 to 85% RH (Non-condensing)
Withstand voltage		500V ac for 1 minute between I/O terminal (dc) and frame ground (power unit)
Insulation resistance		100 MΩ or more at 500 mega V DC between I/O terminal (dc) and frame ground (power unit)
Vibration immunity		10 to 55Hz, 1 cycle/minute: double amplitude of 0.75 mm, 10 minutes on 3 axis (X,Y, Z)
Shock immunity		Peak acceleration and duration 15g/11 ms, 3 times in each X, Y, Z direction
Noise immunity		1500Vp-p with 50ns to 1μs pulse width (generated by noise simulator)
Ambience		No corrosive gas, no excessive dust

Performance Specifications

Item		Specifications
Input specification	Number of input points	6 points (INA, INB, RST, INH, ZERO, SUB)
	Input voltage	5 to 12V DC 12 to 24V DC
	Allowable voltage variation range	4.75 to 13.2V DC 10.2 to 26.4V DC
	ON voltage/current	4.5V or less/3 mA or less 9.6V or less/3 mA or less
	OFF voltage/current	1.5V or more/0.6 mA or more 2.5V or more/0.6 mA or more
Counter specification	Number of counter channels	1 point (UP-DOWN COUNTER)
	Counting range	24-bit signed integer (binary format) (-16,777,216 to 16,777,215)
	Max. counting speed	100kcps (Recommended counter input: within 30kcps)
	Input mode	3 modes (direction discrimination: Pulse + Direction, individual input: CW, CCW, phase differential input (1 x, 4 x mode)
	Min. input pulse width	5us (individual input)
	Multiplication function	1 x, 4 x mode (phase differential input mode)

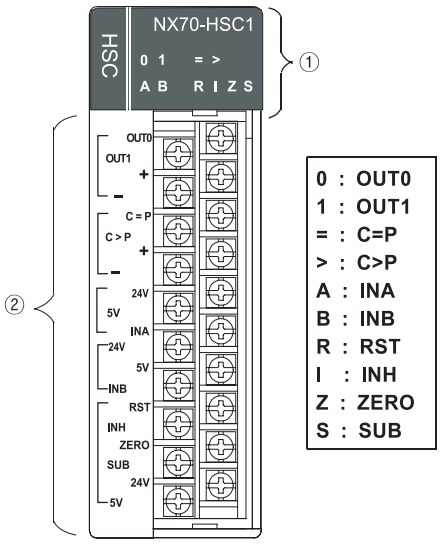
Output Specification

Item		Specifications
General	Isolation method	Photo coupler
	Output format	Transistor output (NPN, open collector)
	Rated use voltage	5 to 24V DC
	Allowable voltage variation range	4.75V to 26.4V DC
	Max. load current	50 mA
	Residual voltage	0.5V or less
	Leakage current	10 uA
Control Output	Number of output points	2 points (C=P, C>P)
	COMMON terminal	2 points/COMMON
	Fuse	N/A
	Response time	OFF -> ON: 10μs or less, ON -> OFF: 100μs or less
Pulse Output	Number of output points	2 points (OUT0, OUT1)
	Output frequency	200 to 40 KHz DUTY 50% ±25%, variation ±5%
	Low-frequency	200 to 5 KHz
	High-frequency	4K to 40 KHz (Min. 36 KHz)
	Variation time	100 to 500 ms
	Rise/fall time	2us or less

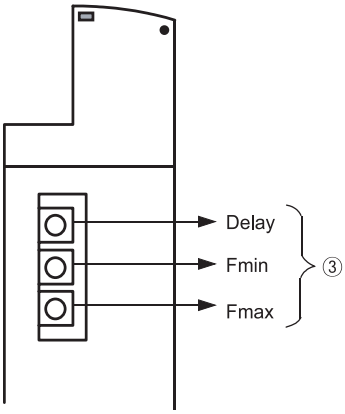
Others

Item	Specifications
Operation indicator	LED
Internal current consumption (5V)	350 mA
External connection method	Terminal block (20-pin)
Suitable cable size	0.5 to 1.25 mm^2
Terminal block terminal screw	M3.0 screw
Occupied I/O points	32 points (16R, 16R) (16 points input, 16 points output)

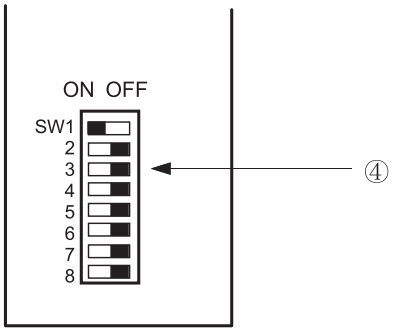
Unit Diagram (NX70-HSC1)



(Front)



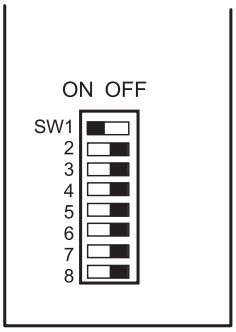
(Bottom)



(Bottom)

1. **Input operation LED**
   Shows ON/OFF status of I/O.
2. **Terminal block (20-pin)**
   Terminal block for I/O and power wiring.
3. **Pulse output adjustment volume**
   Adjusts pulse output frequency or conversion time.
4. **Mode switch**
   DIP switch for shifting counter unit function. Preset as SW1: ON, others OFF (phase differential input, 4 x mode).
   (See *"Mode Switch" in Chapter 1, "Mode Switch" in Chapter 2*.)

Mode Switch

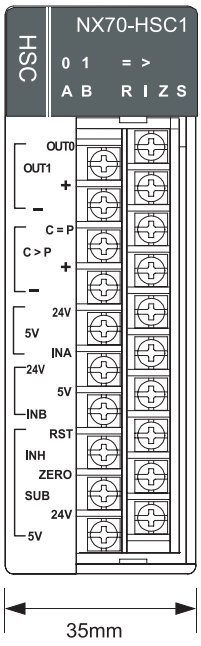


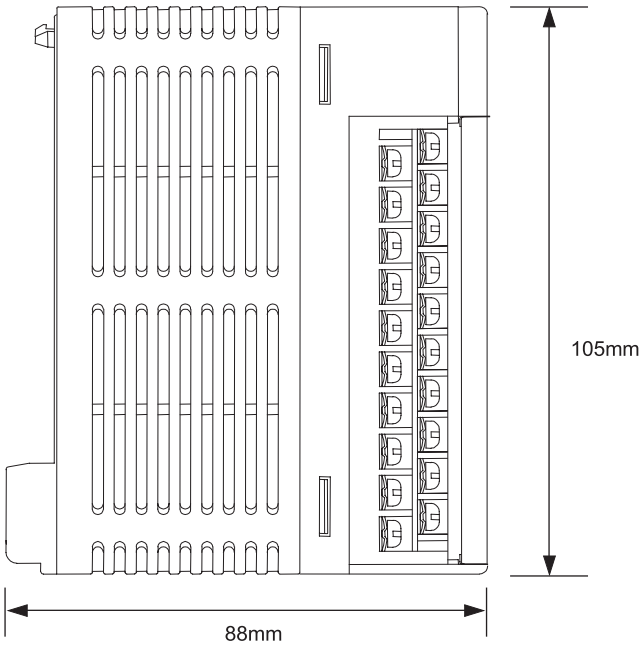
	ON	OFF
SW1	(SW1/SW2)	
SW2	1. OFF/OFF: Direction discrimination input (PULSE + SIGN) 2. OFF/ON: Individual input mode (CW + CCW) 3. ON/OFF: Phase differential input mode (4 x mode)..... Recommended 4. ON, ON Phase differential input mode (1 x mode)	

SW3	Retentive Output	Non-retentive output
SW4	Pulse output internal count	Pulse output external count
SW5	C=P mode	C=0 mode
SW6	1 pulse output	2 pulse output

SW7 and SW8 are not used.

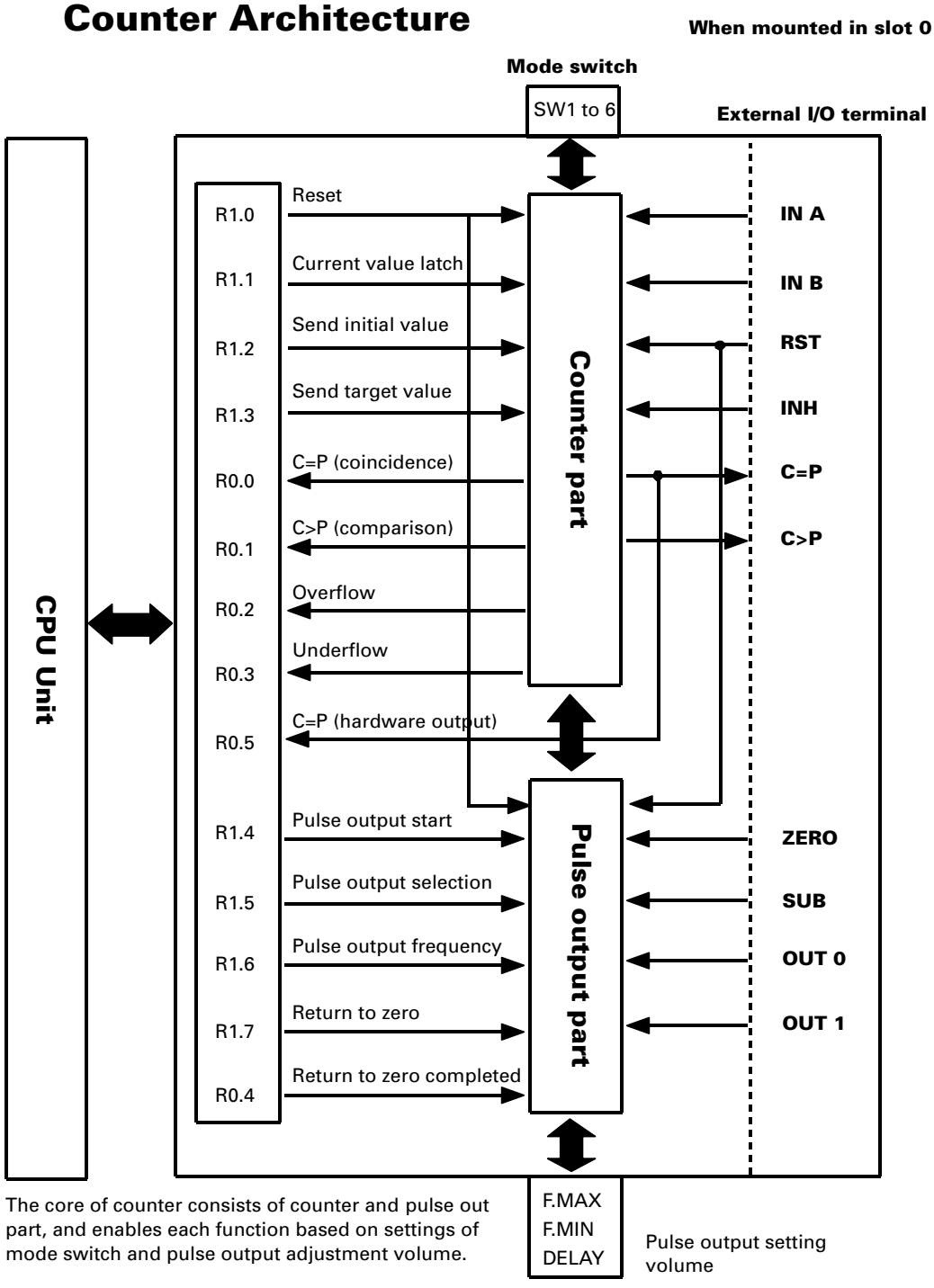
Dimensions





Operation Description

Counter Architecture



The core of counter consists of counter and pulse out part, and enables each function based on settings of mode switch and pulse output adjustment volume.

I/O Contact

NX70 PLC High-speed Counter Unit (NX70-HSC1) occupies 16 points input and 16 points output, totaling 32 points. (Internally, only 6 points input and 8 points output are used.)

Input Contact

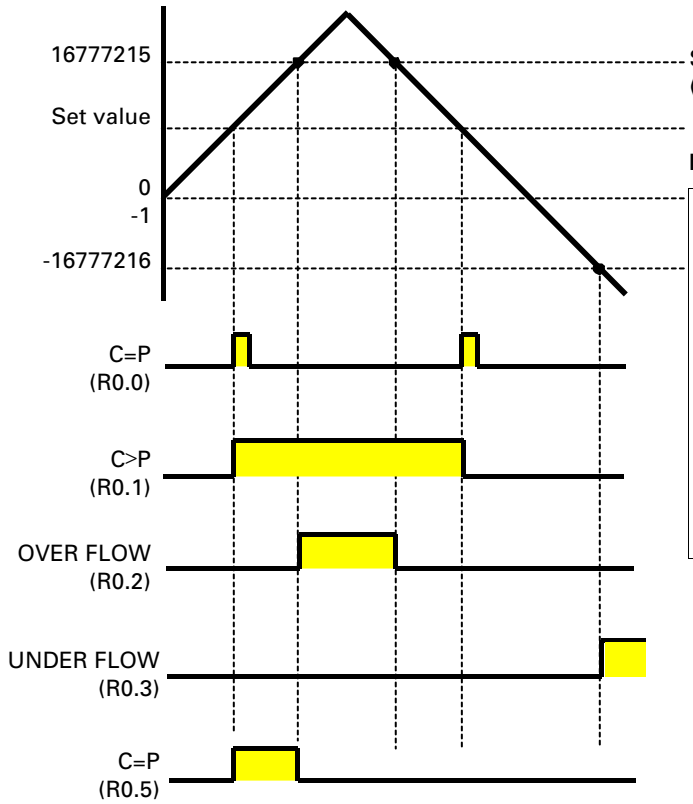
Input Contact	Name
R0.0	C=P (coincidence output)
R0.1	C>P (comparison output)
R0.2	OVER FLOW
R0.3	UNDER FLOW
R0.4	Return to zero completed.
R0.5	C=P (hardware output)
R0.6 to R0.15	Unused

C: Current value

P: Set value (target value)

C=P, C>P output can be external output.
(Specification differs partly based on the mode.)

Relation between internal relay and current value (R0.0 to R0.3)



Set value can be only positive.
(0 to 16777215)

Flag Variation

C=P (R0.0): ON when current value = set value.

C>P: ON when current value > set value.

OVER FLOW: ON when current value > 16777215

UNDER FLOW: ON when current value < -16777216

C=P (R0.5): Coincide with external output C=P and output width is 100ms and retained, based on DIP switch setting on the bottom of the unit.

NOTE If OVER FLOW/UNDER FLOW occurs two consecutive times, flag variations after that will be incorrect. So precaution is required.

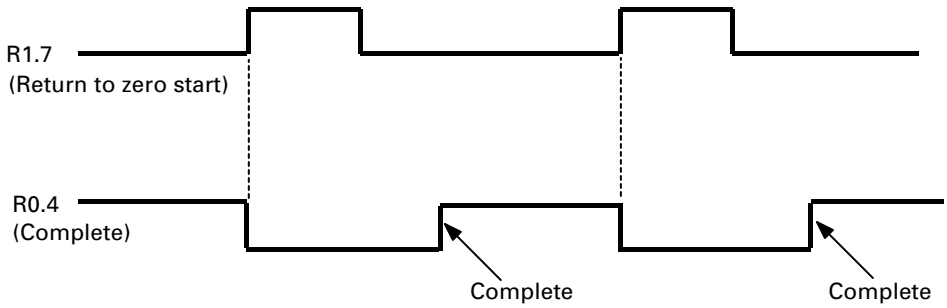
R0.0 to R0.3

When operating with comparison relay from R0.0 to R0.3, CPU unit scan time must be considered as below. When scan time is long, operation will be delayed. Specifically R0.0 [C=P] turns on only when the current value coincides with target value, so if the ON time is short it may not be input to CPU unit.

In such cases, connect external output (C=P) to other input unit and input to CPU unit, or use R0.5 (hardware coincidence output: same as external output C=P).

R0.4: Return to zero completed flag

Indicated it has arrived at zero in return to zero mode, and retained until the next return to zero contact (R1.7) turns ON. See *"Return to zero mode" in Chapter 2* for more detail on return to zero mode.



R0.5: Coincidence output flag

Same signal as external output terminal C=P. Either 100 ms ON output or Retentive output can be selected using the mode switch.

R0.5 output is synchronized with input pulse, so when current value and target value coincides at zero, like in the case of power input, output disables. See *"SW3, SW5 (Coincidence Output Mode Selection)" in Chapter 2*.

Output Contact

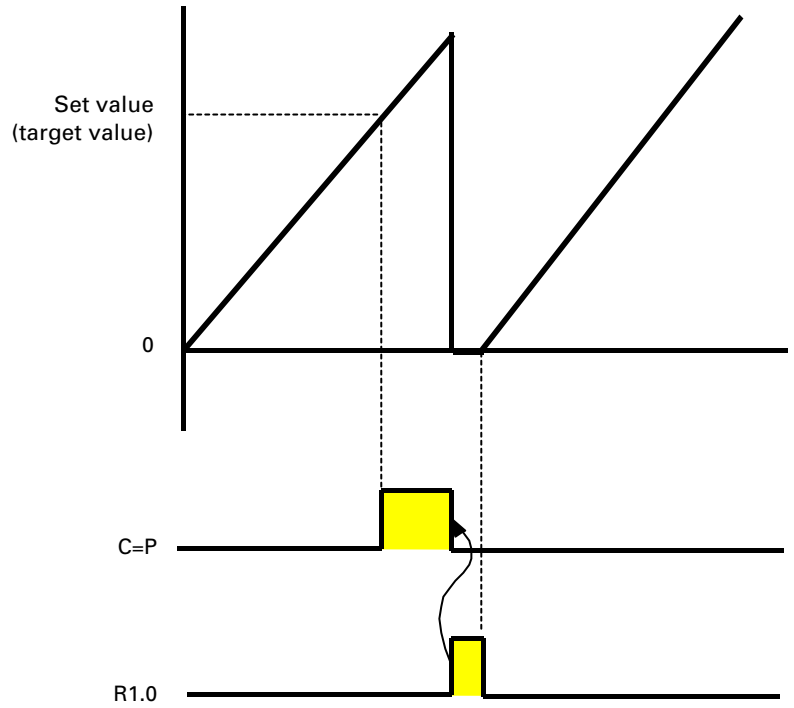
Mounted in slot 0

Input Contact	Name
R1.0	Counter reset
R1.1	Counter current value input
R1.2	Counter initial value setting
R1.3	Counter target value (set value) setting
R1.4	Pulse output start
R1.5	Pulse output selection
R1.6	Pulse frequency conversion
R1.7	Return to zero instruction
R1.8 to R1.15	Unused

R1.0: Counter reset

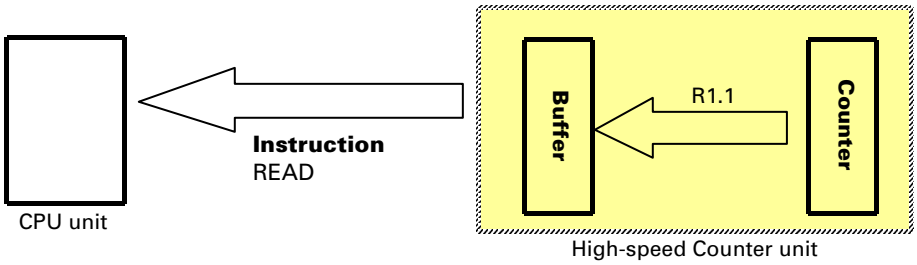
When this relay is ON, the current value and target values are reset (to zero) and C=P (coincidence output) is also turned OFF. Pulse output is also turned OFF. This contact operates just like external input (RST).

Counter does not operate when R1.0 contact is ON, so turn it OFF when counter operation is needed again.

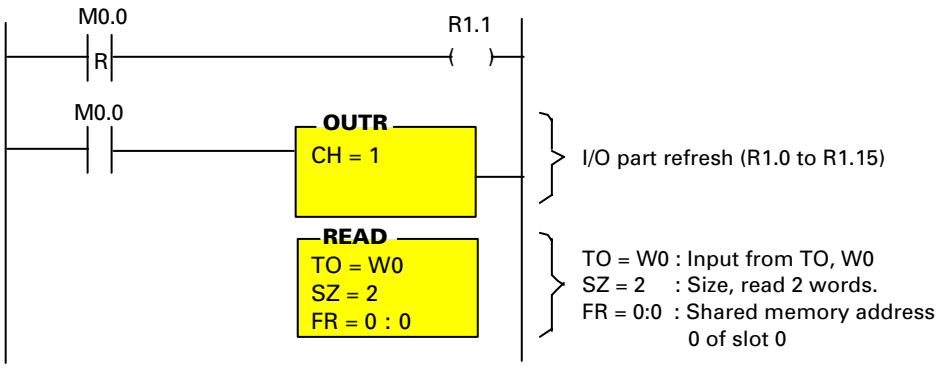


R1.1: Counter current value input

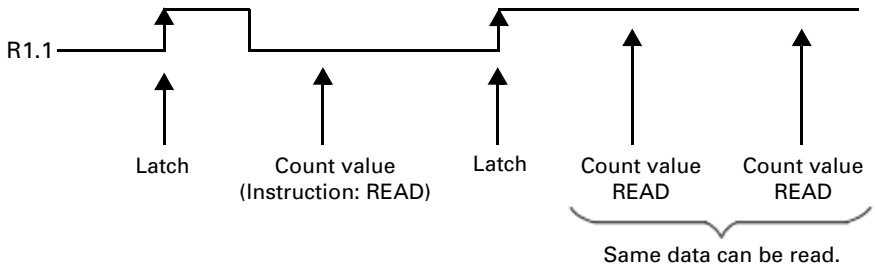
When this output contact is ON, current value at the counter is stored in the inside buffer of the counter.
Data READ is executed with transmission instruction. When R1.1 is not ON and current value is read, the inside buffer of High-speed Counter is not written so the previous input data will be read.



When High-speed Counter (NX70-HSC1) is mounted in slot 0 and counter current value is sent to W0 and W1



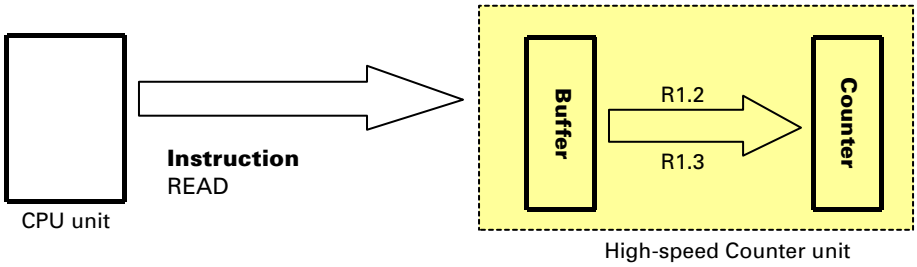
When M0.0 turns ON, R1.1 is turned ON by I/O part refresh and two words of counter current value (address 0 to 1) are sent to W0 to W1. When outputting converted current value, turn R1.1 OFF and ON again.



R1.2: Send initial value

R1.3: Send target value

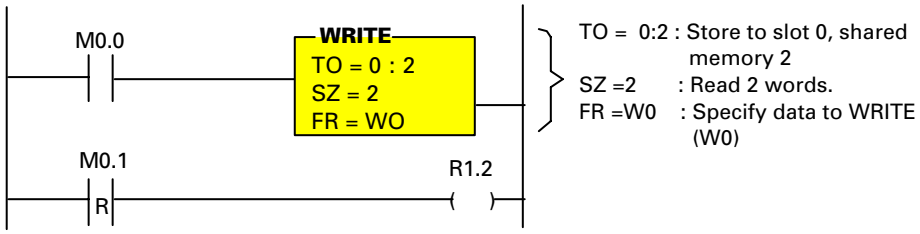
When this output contact turns ON, the data pre-sent to the inside buffer of High-speed Counter is set as initial and target value (set value) for counter. When R1.2 to R1.3 are turned ON before the initial value and target value data are sent to the inside buffer of High-speed Counter, the previously sent buffer data is set.



In addition, when R1.2 is turned ON, coincidence output (C=P) turns OFF at the same time.

Program Example 2)

When High-speed Counter is mounted in slot 0 and set W0 and W1 data as the initial value of High-speed Counter.



(Note) When resetting initial and target values, turn R1.2 and R1.3 OFF and ON again. They should be turned on for only 1 scan, as shown above.

R1.4: Pulse output start

When this output contact is ON, pulse is output from the output terminal decided based on the mode switch on the bottom of the unit and R1.5 (pulse output selection).

R1.5: Pulse output selection

Decides from which one of OUT0 and OUT1 the pulse from R1.4 (pulse output start) should be sent out when the mode switch is set to pulse output 2.

R1.6: Pulse frequency conversion

Outputs pulse with frequency pre-set with volume with converted high- and low- frequencies.

R1.7: Return to zero

When this output contact is ON, return to zero mode starts.

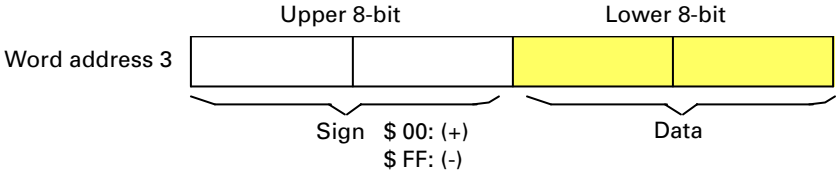
I/O Data (Word)

The set values and current values of the initial and current values from NX70 PLC High-speed Counter can be read. Each data (course/initial/ objective) consists of 32-bit and is segmented as shown in the table below. Data I/O is controlled by READ, WRITE instructions in NX70 series.

Shared memory MAP of High-speed Counter

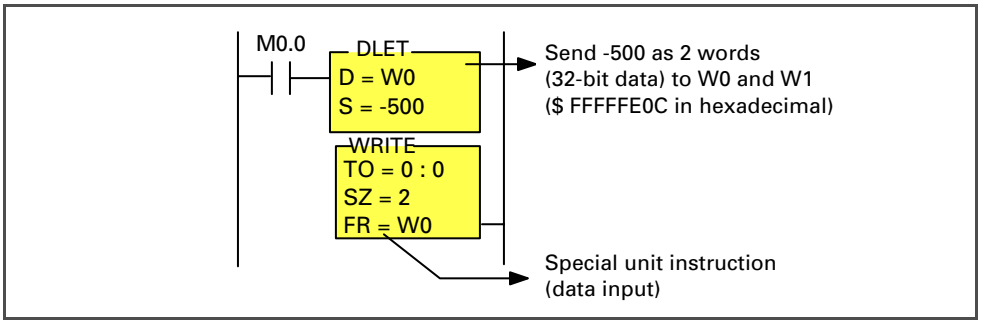
Instruction / Word address		READ	WRITE
1	32-bit	Current value (Lower 16-bit)	Initial value (Lower 16-bit)
1		Current value (Upper 8-bit and sign)	Initial value (Upper 8-bit and sign)
2	32-bit	—	Target value (Lower 16-bit)
3		—	Target value (Upper 8-bit (only positive sign))

NOTE All set to zero during power input.
Current value and initial value have a sign bit at the most significatn bit (MSB), bit 8. So if it is set as " $ FF", it becomes a negative number.



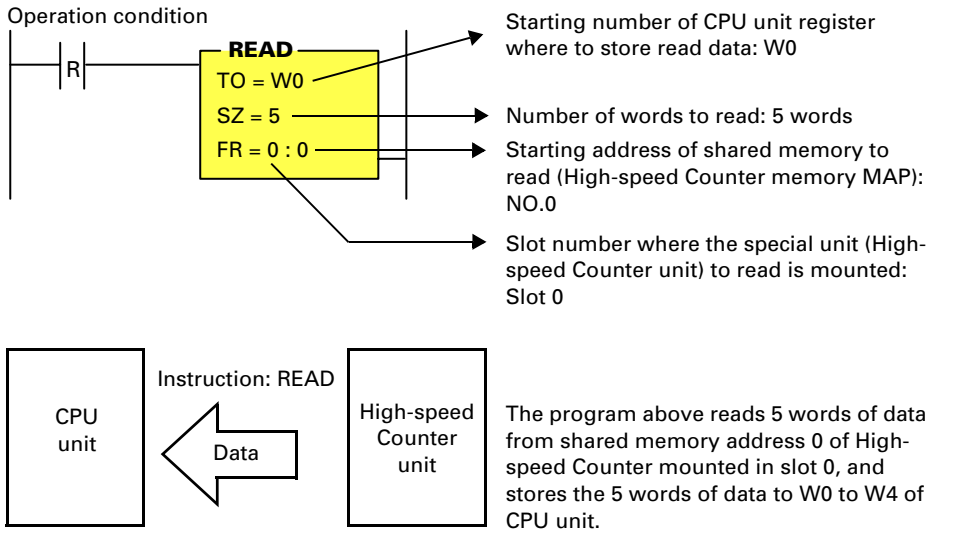
* Target value setting is not accepted as “H FF”.

When writing data as decimal number, do the following:



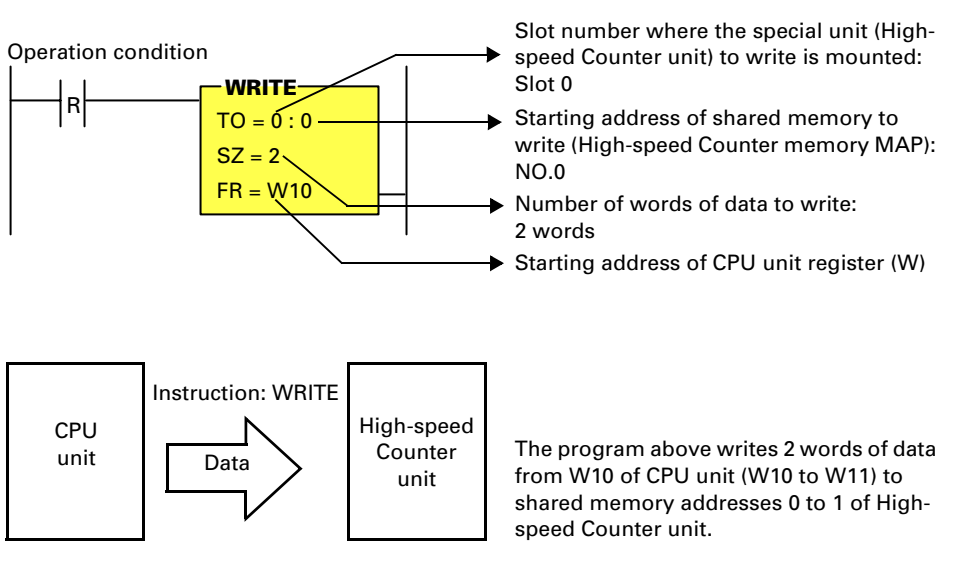
Advanced Instructions

Instruction: READ


Operation condition
R
READ
TO = W0
SZ = 5
FR = 0 : 0
Starting number of CPU unit register where to store read data: W0
Number of words to read: 5 words
Starting address of shared memory to read (High-speed Counter memory MAP): NO.0
Slot number where the special unit (High-speed Counter unit) to read is mounted: Slot 0
CPU unit
Instruction: READ
Data
High-speed Counter unit
The program above reads 5 words of data from shared memory address 0 of High-speed Counter mounted in slot 0, and stores the 5 words of data to W0 to W4 of CPU unit.

Instruction: WRITE

Program example where NX70-HSC1 is mounted in slot 0 and only CH0 is being used.


Operation condition
R
WRITE
TO = 0 : 0
SZ = 2
FR = W10
Slot number where the special unit (High-speed Counter unit) to write is mounted: Slot 0
Starting address of shared memory to write (High-speed Counter memory MAP): NO.0
Number of words of data to write: 2 words
Starting address of CPU unit register (W)
CPU unit
Instruction: WRITE
Data
High-speed Counter unit
The program above writes 2 words of data from W10 of CPU unit (W10 to W11) to shared memory addresses 0 to 1 of High-speed Counter unit.

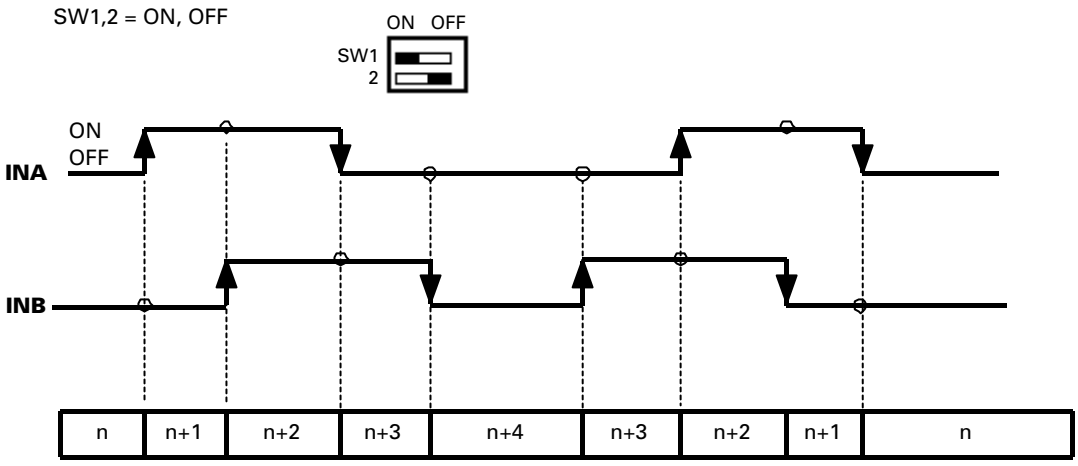
I/O Terminal

Input Terminal

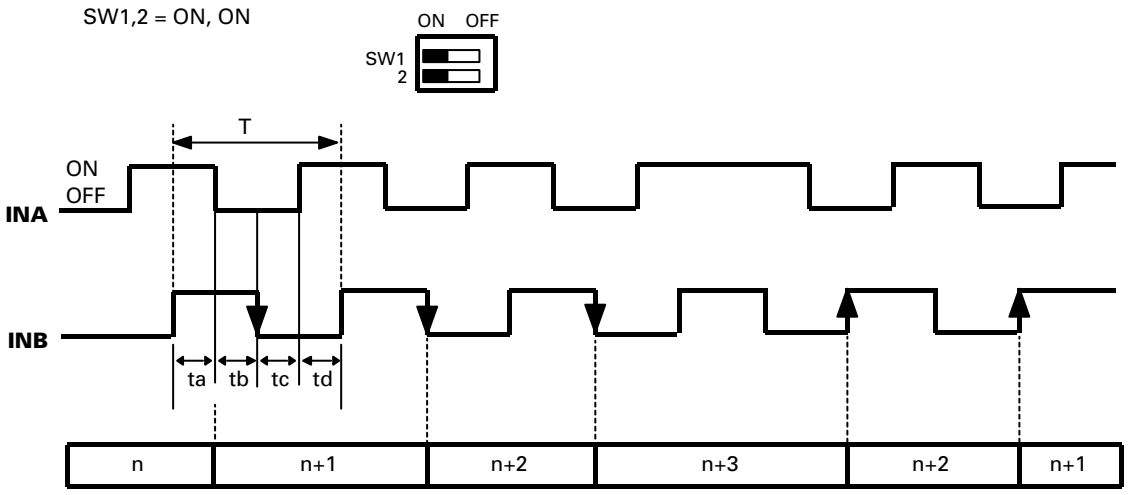
Counter Input Terminal (INA, INB)

The input terminals of High-speed Counter support 3 input modes: phase differential input (2-phase input)/direction discrimination input/individual input. (Set by DIP switch as illustrated below.)

Phase differential input mode (2-phase mode), 4 x mode:
Usually this mode is recommended. (noise countermeasure)
(You must use this mode when counting encoder output)

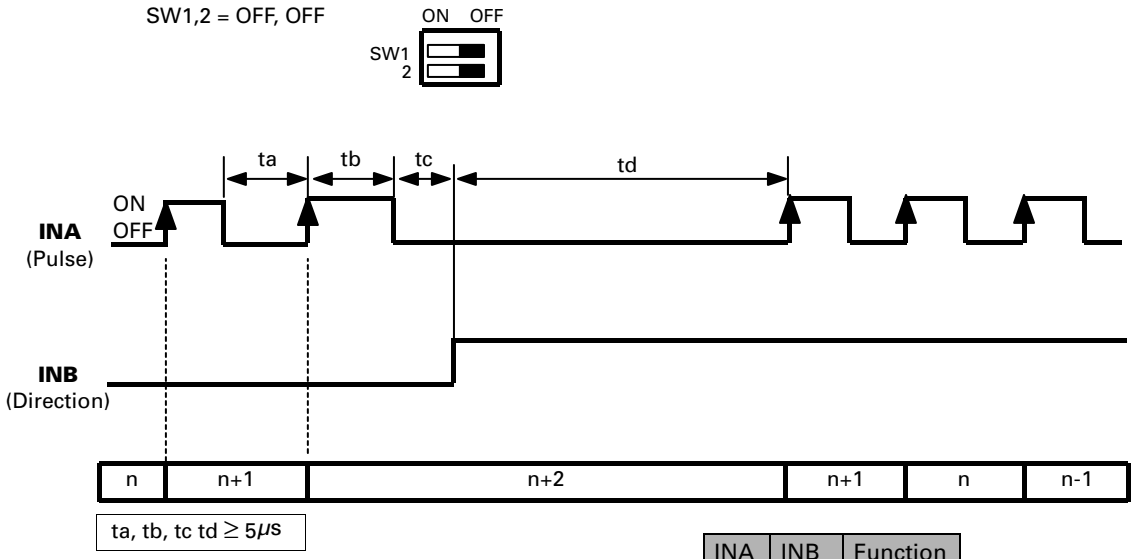


Phase differential input mode (2-phase mode), 1 x mode



ta. tb. tc. td $\geq$ 1/8T
T $\geq$ 10μs

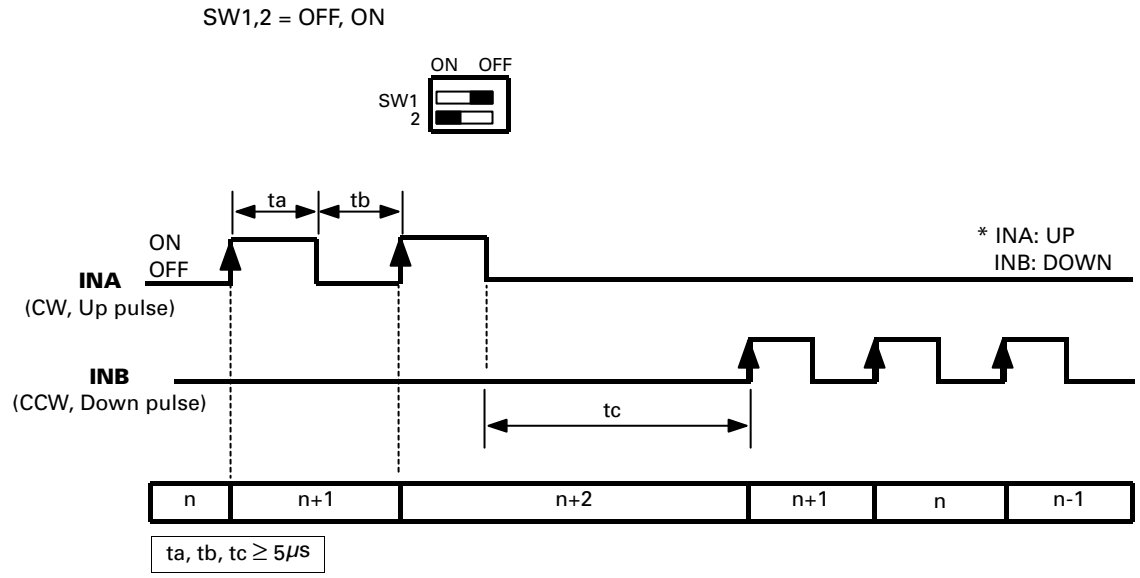
Direction discrimination input mode (Pulse + Direction)



INA	INB	Function
↑	H	Down
↓	L	Up

* H: ON
L: OPEN(OFF)

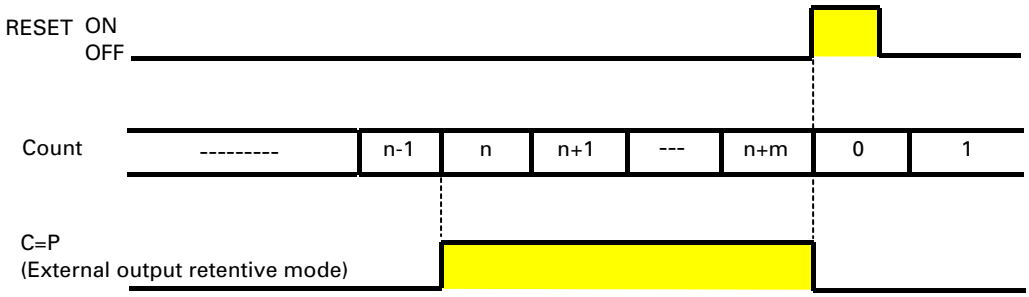
Individual input mode (CW + CCW)



Control Input Terminal

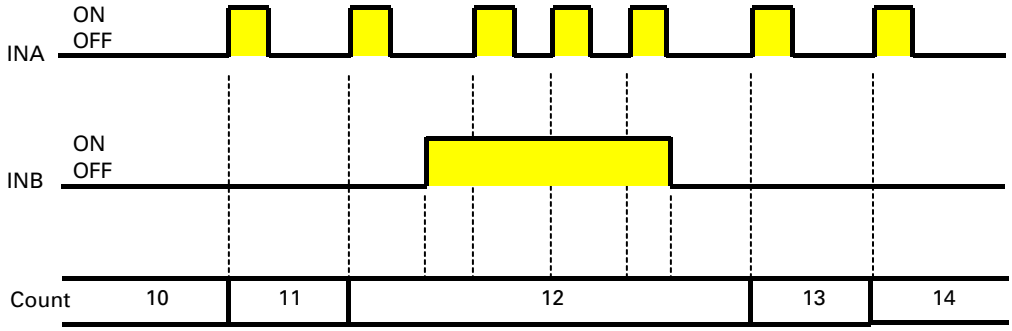
Reset input terminal (RST)

Resets course and target values of High-speed Counter (to zero). Turns OFF when coincidence output (C=P) is on. Specifically, pulse output also turns OFF. (Operates as same level with Internal contact R1.0 of High-speed Counter.



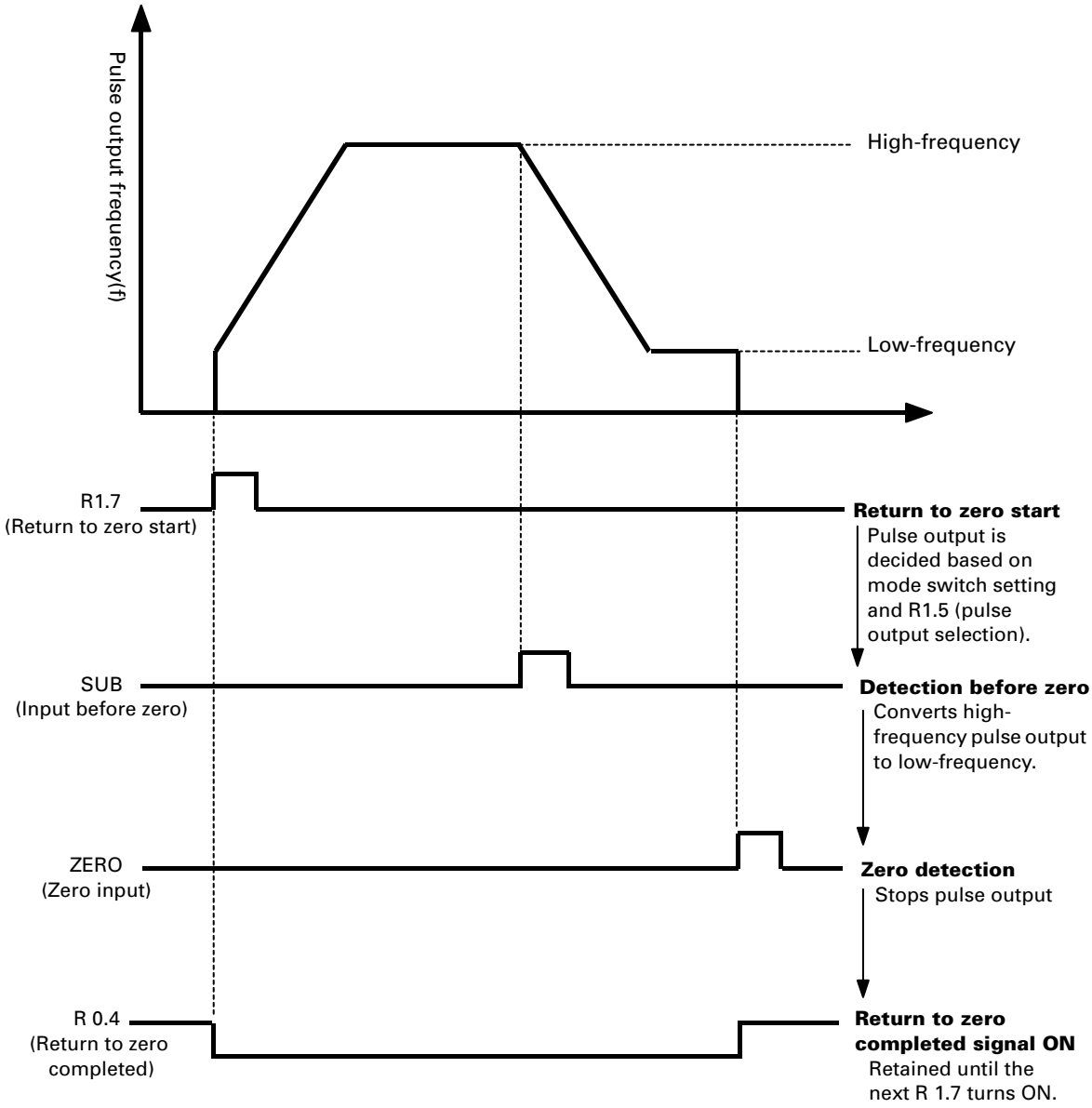
Counter inhibition input terminal (INH)

When this terminal is ON, input on count input (INA, INB) is not counted.



Pulse output control input (ZERO, SUB)

Used as return to zero signal input terminal when controlling motor by using pulse output (OUT0, OUT1). Converts high-speed pulse to low-speed when SUB turns ON, and stops pulse output when ZERO is ON.



NOTE Pulse output does not stop even when ZERO turns ON before SUB turns ON.

Output Terminal

Pulse Output (OUT 0, OUT 1)

Pulse output terminal for controlling step motor. Enables temporary location decision. Output method can be set by mode switch to either **1 pulse output or 2 pulse output**.

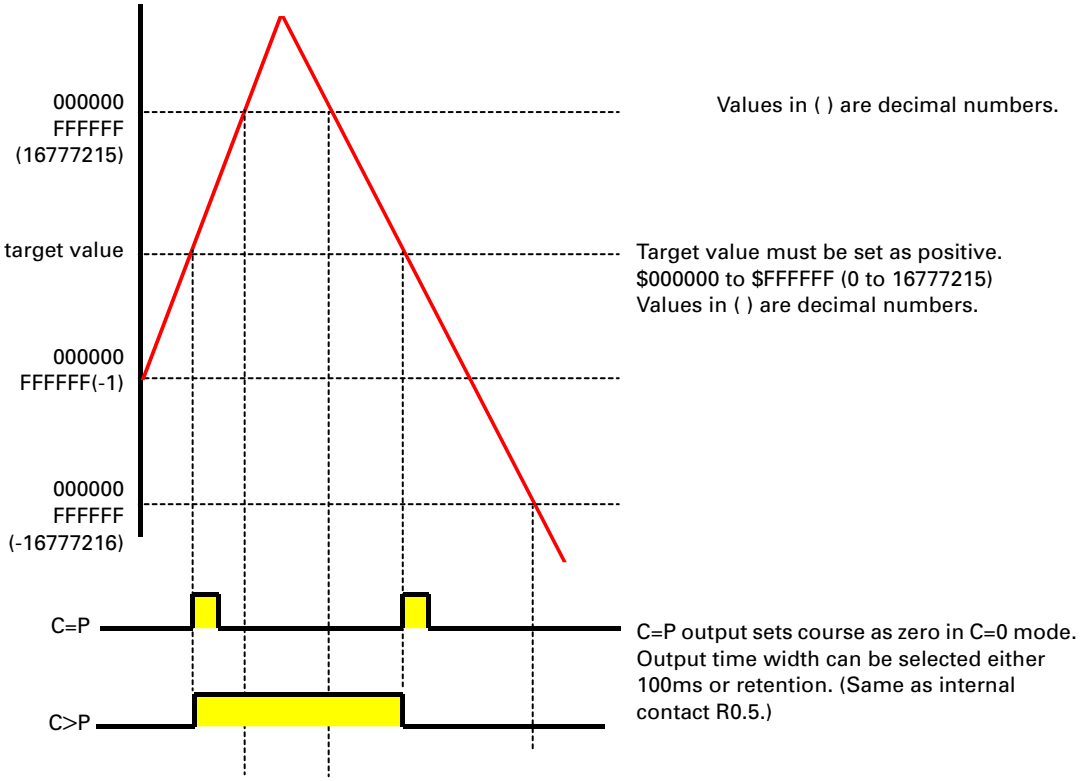
- 1 pulse output mode (SW6-ON)
- 2 pulse output mode (SW6-OFF)

Pulse output condition: Starts when R1.4 turns ON. (Usual mode)
Starts when R1.7 turns ON. (Return to zero mode)

Pulse output stop condition: R1.0 turns ON
RST input turns ON
Coincidence output (C=P) turns ON
[C=P output turns on at zero in C=0 mode] See *"Chapter 2"* for more details.

Comparison Output (C>P, C=P)

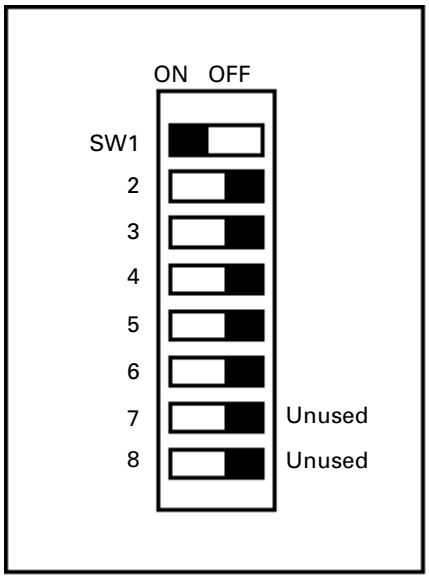
Outputs the comparison between current and target values of counter.



Mode Switch

Mode switch on the bottom of High-speed Counter unit (NX70-HSC1) determines the following functions. DIP switch consists of 8 switches. SW7 and SW8 are not used.

As default, DIP switches are set as shown on the right: SW1: ON, and the others are OFF (phase differential input, 4 x mode).



High-speed Counter unit
(NX70-HSC1) bottom
(Mode switch)

Function of each switch is as follows:

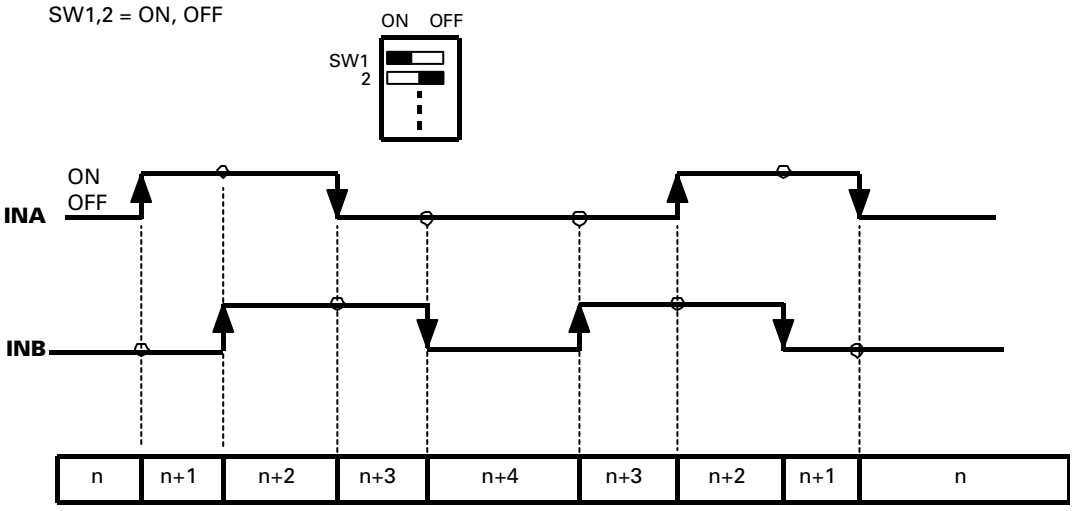
	ON	OFF
SW1	(SW1/SW2) 1. OFF/OFF: Direction discrimination input (PULSE + SIGN) 2. OFF/ON: Individual input mode (CW + CCW) 3. ON/OFF: Phase differential input mode (4 x mode): Recommended (manufacturer default)	
SW2	4. ON/ON Phase differential input mode (1 x mode)	

SW3	Retentive output	Non-retnetive output
SW4	Pulse output internal count	Pulse output external count
SW5	C=P mode	C=0 mode
SW6	1 pulse output	2 pulse output

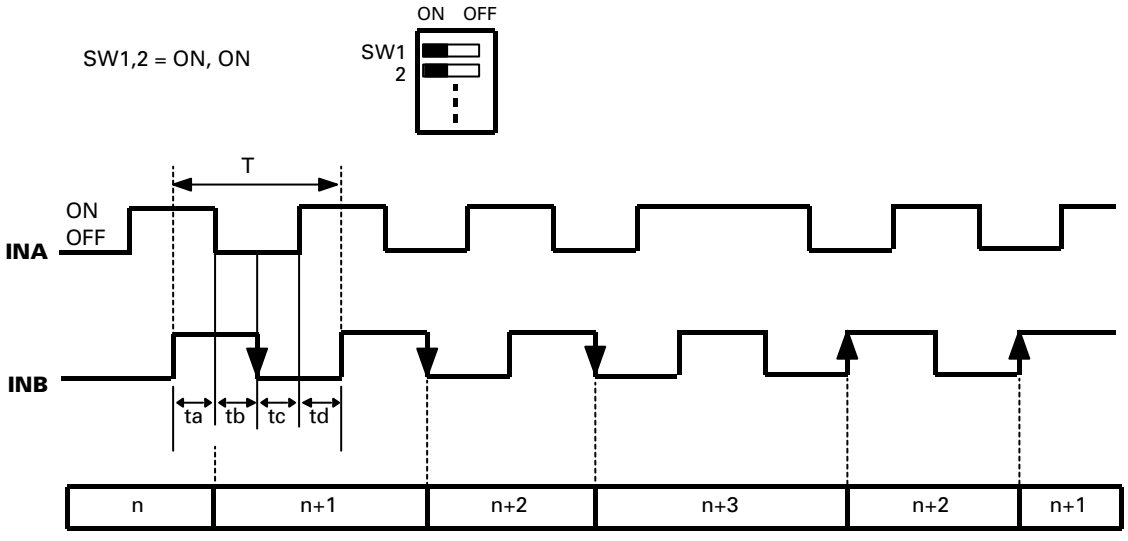
* SW7 and SW8 are not used.

SW1, 2 (Input mode switch)

Phase differential input mode (2-phase mode), 4 x mode:
Usually this mode is recommended. (noise countermeasure)
(You must use this mode when counting encoder output.)

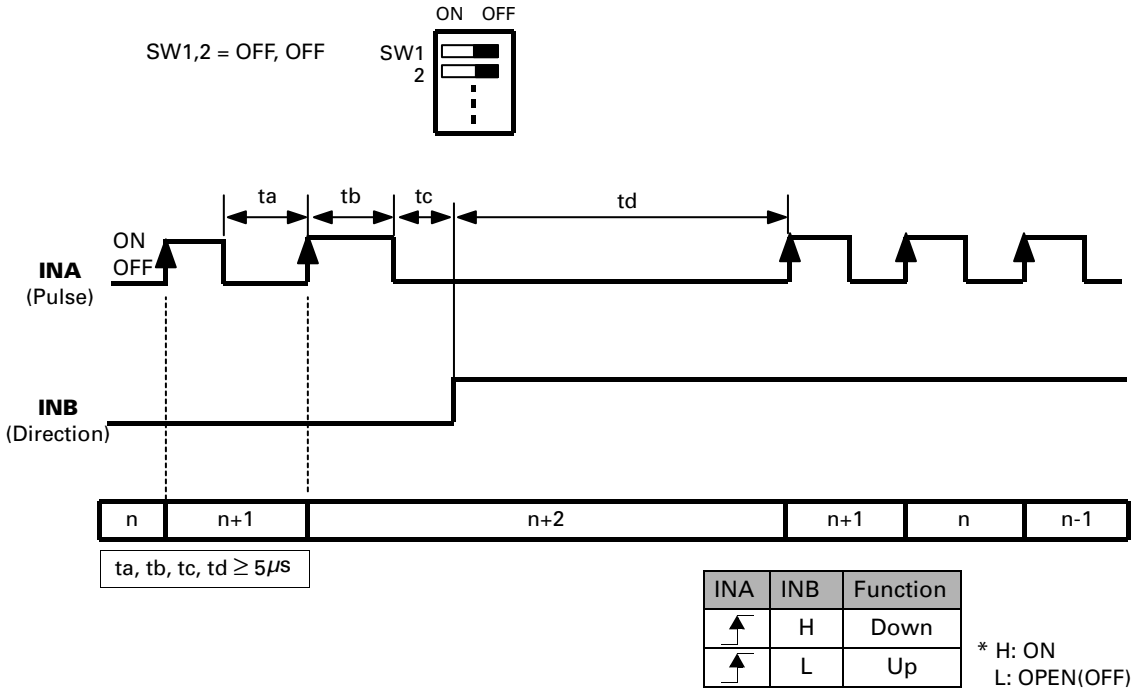


Phase differential input mode (2-phase mode), 1 x mode



ta. tb. tc. td ≥ 1/8T
T ≥ 10us

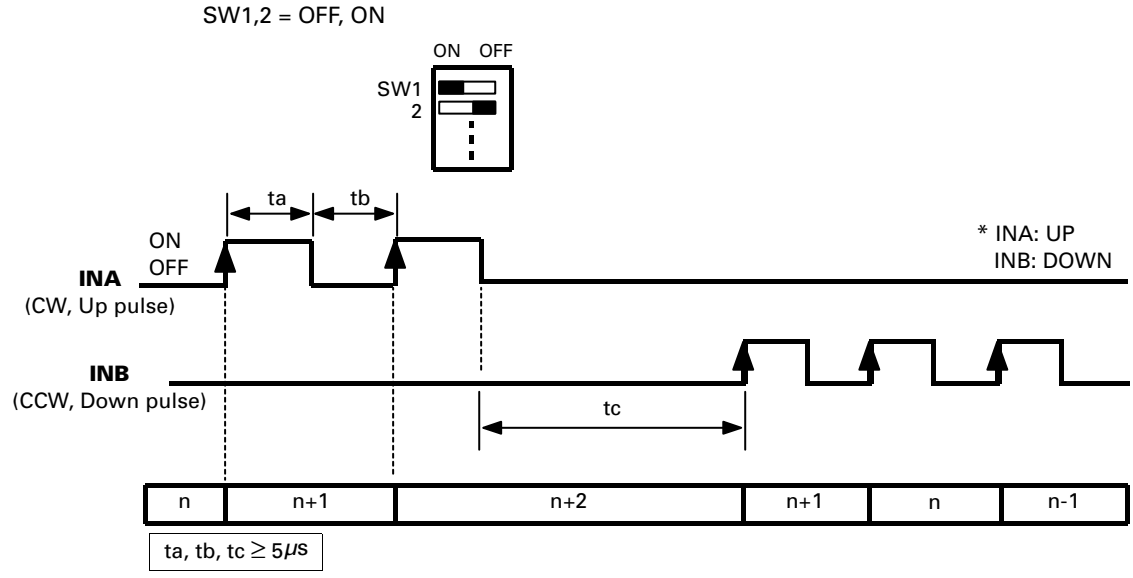
Direction discrimination input mode (Pulse + Direction)



INA	INB	Function
↑	H	Down
↓	L	Up

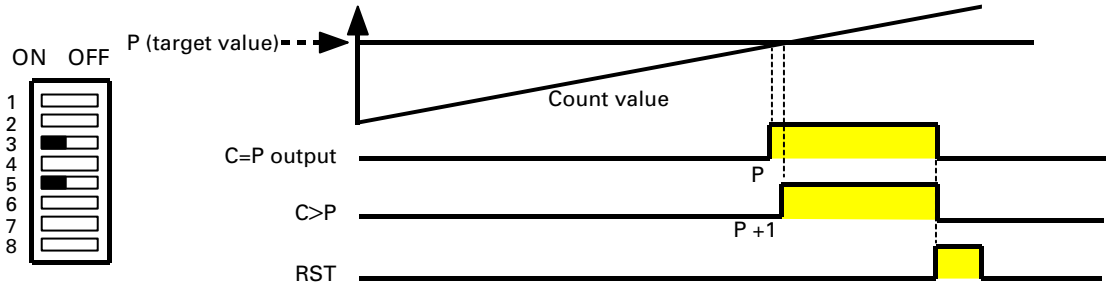
* H: ON
L: OPEN(OFF)

Individual input mode (CW + CCW)



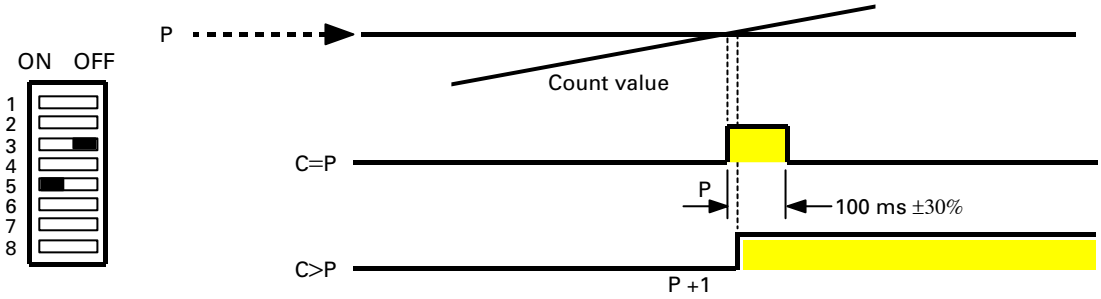
SW3, SW5 (Coincidence Output Mode Selection)

C=P Retentive Output (SW3, SW5 -> ON)

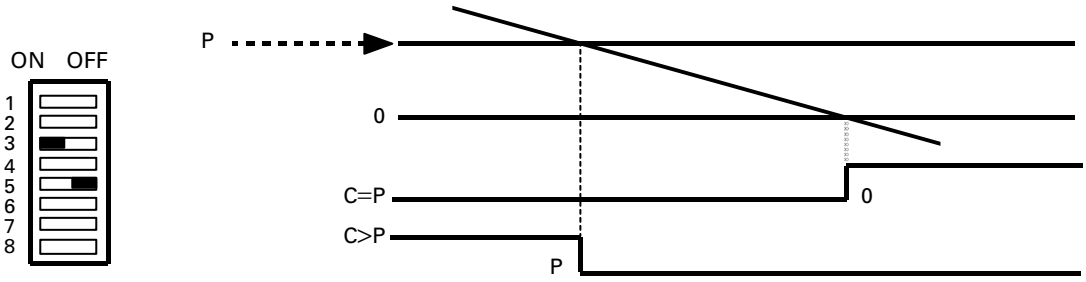


Output C=P turns OFF when data is newly set with RST input R1.0 or counter. When count value and target value coincide, like power input, C=P output is OFF. (Coincidence output only turns ON when the count value of pulse count coincides with target value.)

C=P Non-retnetive output (SW3 -> OFF, SW5 -> ON)

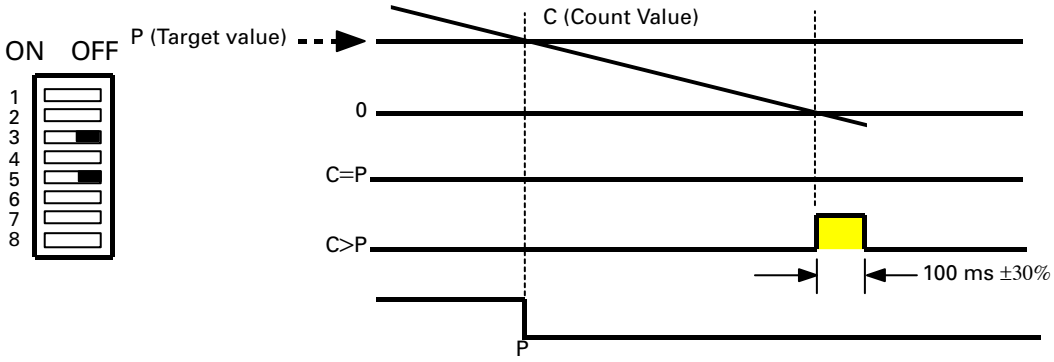


C=0 Retentive Output (SW3 -> ON, SW5 -> OFF)

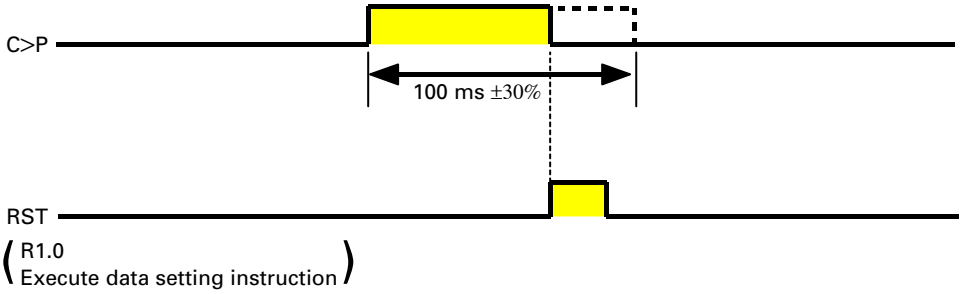


NOTE Output turns ON when count value is 0 in C=0 mode. C>P output starts according to target value P.

C=0 Non-retentive output (SW3, SW5 -> OFF)



Even in non-retentive output mode, C=P stops when C=P output 100ms ends, initializes counter, or RST input or R1.0 turns ON.

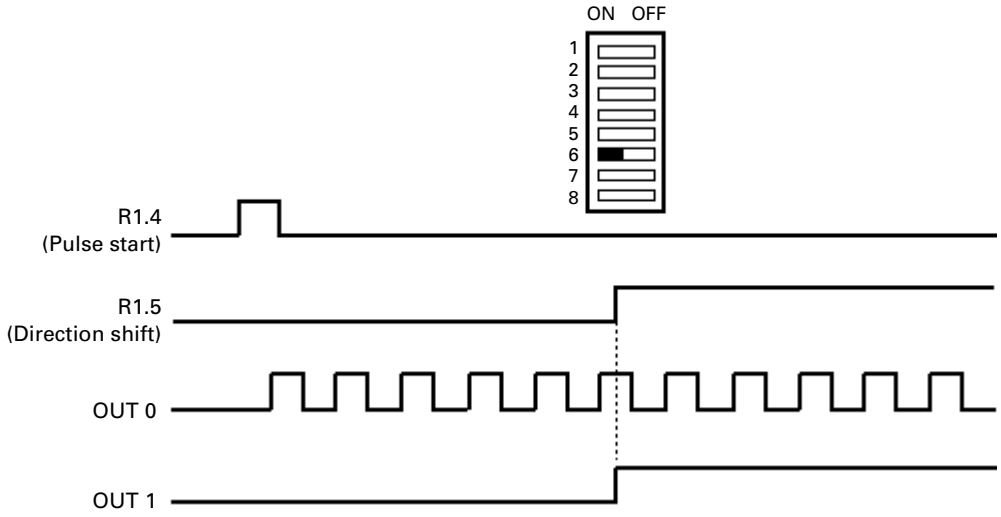


These C=P, C>P output not only externally, but also to internal relay (R0.1, R0.5).

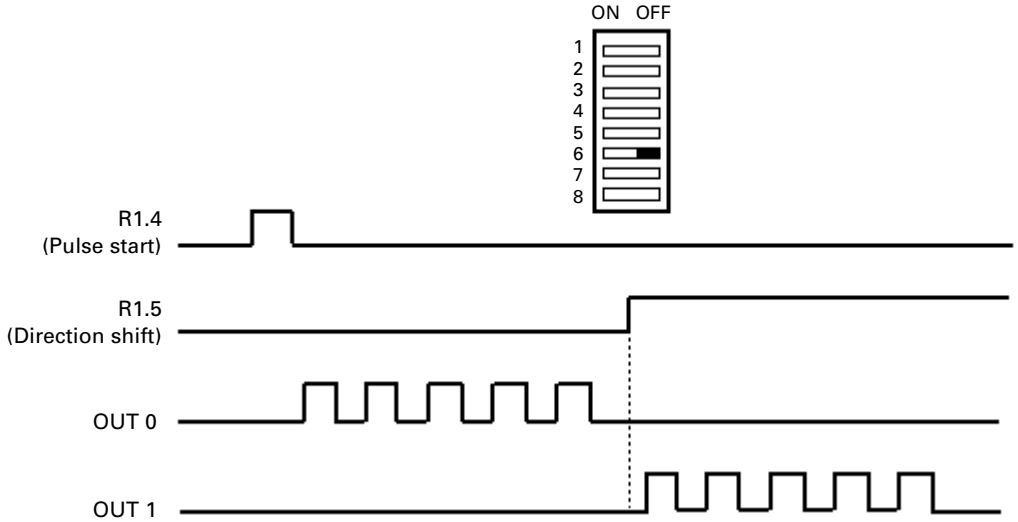
SW6 (Pulse output mode switch)

Switch pulse output to external terminal (OUT0, OUT1) output mode.

1 pulse output mode (SW6-> ON)



2 pulse output mode (SW6 -> OFF)



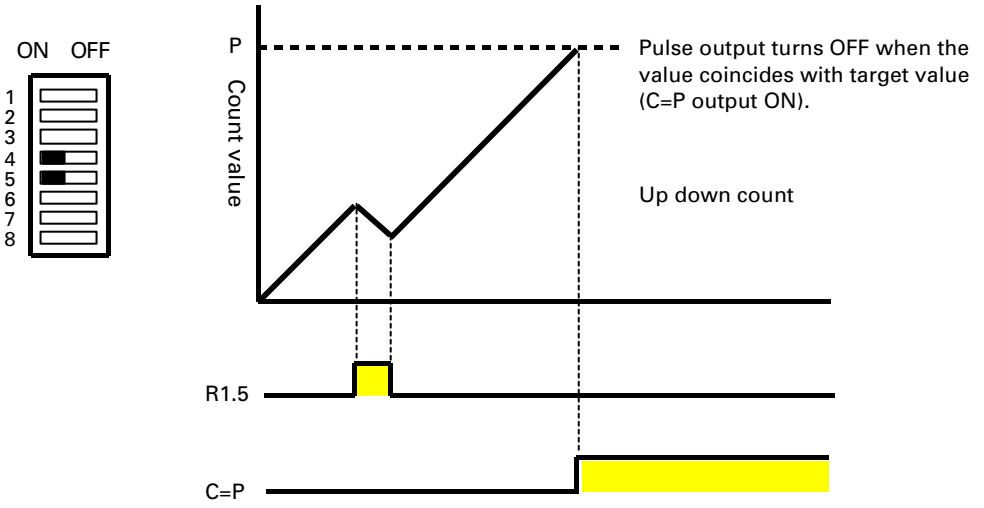
Pulse frequency from OUT0 and OUT1 is adjusted by external volume.

SW4, SW5 (pulse output and count operation)

NX70 PLC High-speed Counter (NX70-HSC1) unit has pulse output function for temporary location decision. SW4 decides whether to count pulse output internally or to count external pulse input from input terminal.
SW5 decides count mode. When using pulse output and external input, set input frequency to 40KHz or less.

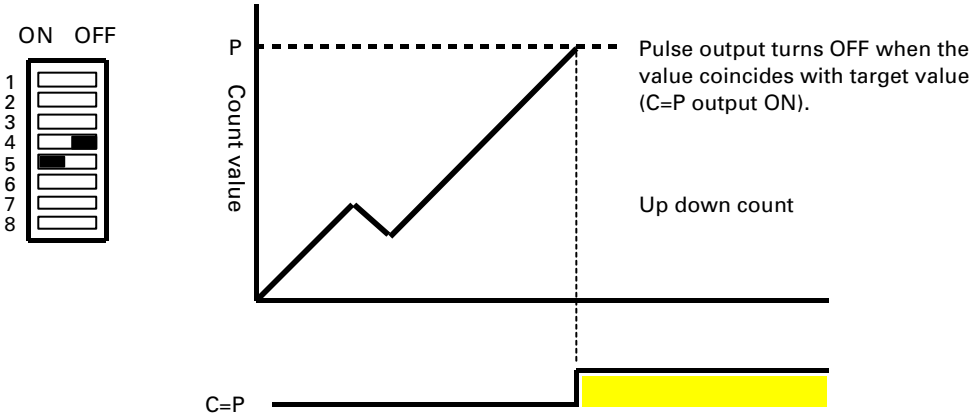
Internal count: Up down mode (SW4.5 -> ON)

Counts pulse output internally. (**Do not connect to internal terminal INA and INB.**)

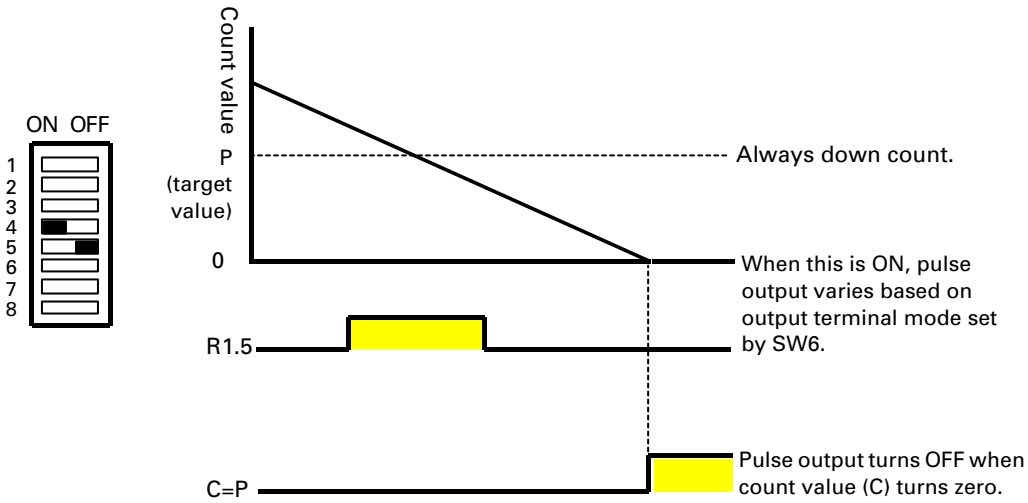


When R1.5 is ON, pulse output varies based on output terminal mode set by SW6.

External count: Up down mode (SW4 -> OFF, SW5 -> ON)

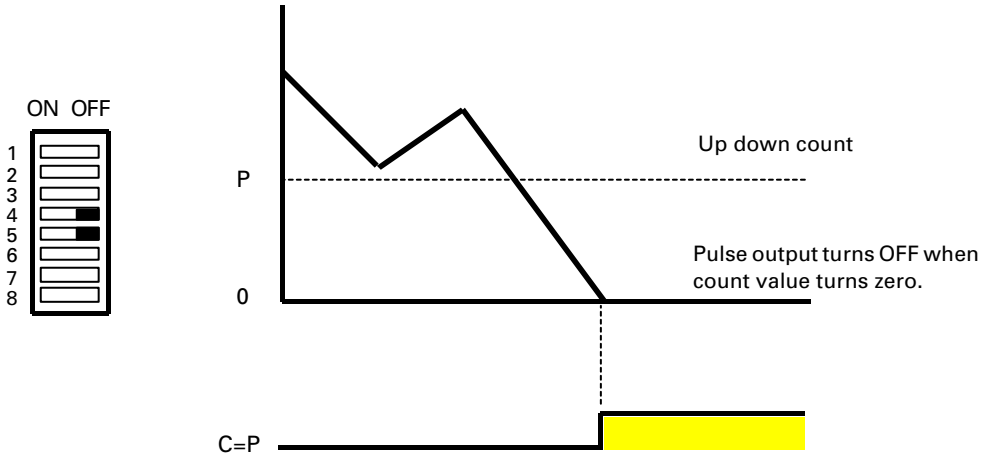


Internal count: down counter (SW4 -> ON, SW5 -> OFF)



Do not connect anything to external terminal INA and INB when counting pulse output internally.

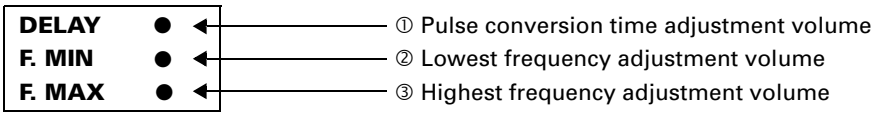
External count: Up down counter (SW4, SW5 → OFF)



Pulse Output Function

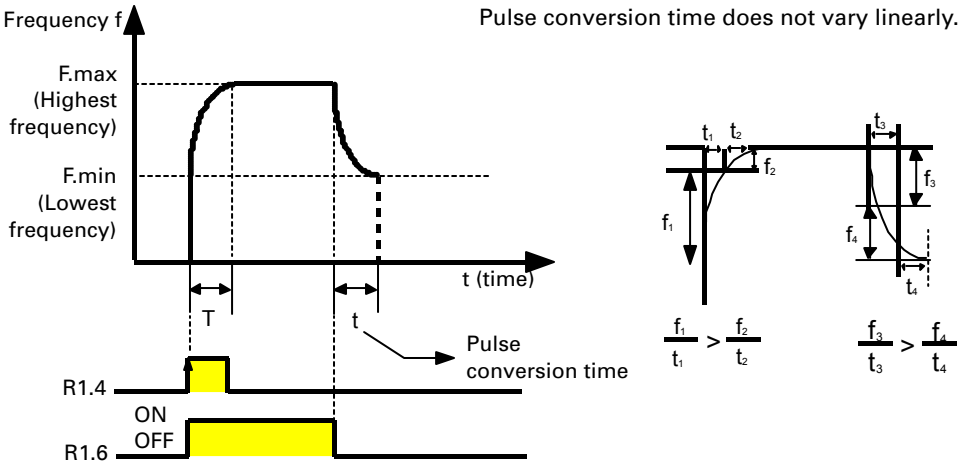
Adjustment volume

NX70 PLC High-speed Counter unit (NX70-HSC1) has pulse output function, which enables control of pulse motor and slow up down control for servo motor.



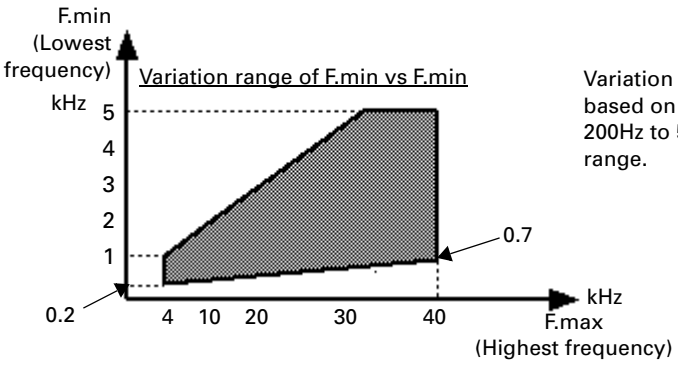
Pulse conversion time adjustment volume (DELAY)

Decides pulse conversion time T, which is the time period when the lowest frequency F.MIN turns to the highest frequency F.MAX, or F.MAX turns to F.MIN that is pre-set by volume resistance. (100 to 500ms)



Lowest frequency adjustment volume (F.MIN)

Adjust F.min, that is, the lowest of output pulse frequency when R1.6 (frequency conversion relay) is OFF. (200HZ to 5kHZ)

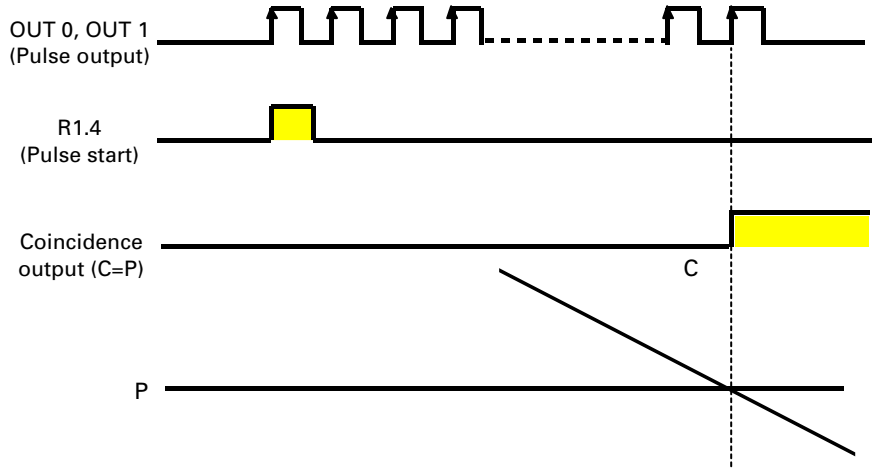


Variation range of F.min is decided based on F.max. Part of range from 200Hz to 5kHz will be the variation range.

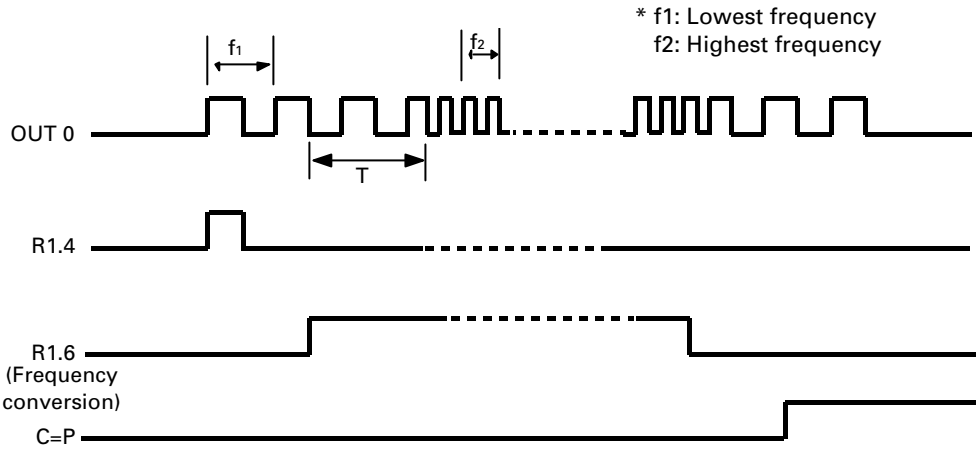
Highest frequency adjustment volume (F.MAX)

Adjusts F.max, that is, the highest of output pulse frequency when R1.6 is ON. (4kHZ to 40kHZ)

Pulse output description



Pulse output starts at OUT0 and OUT1 terminals when R1.4 (pulse start) turns ON. Output pulse number is monitored by counting output pulse with counter settings. (Count method will be described later in "Frequency Temporary Measurement Program" section.) Pulse output turns OFF when coincidence output is OFF. R1.5 (pulse output selection replay) decides which one of OUT0 or OUT1 will be used for pulse output. To force pulse to OFF during pulse output, use RST input or turn R1.0 to ON.



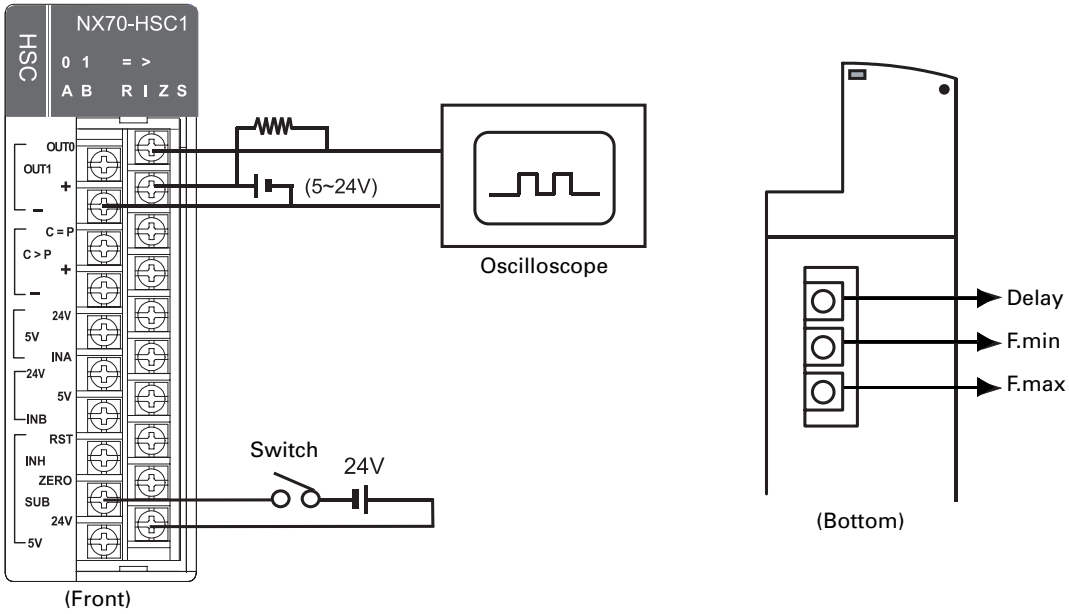
When R1.6 (frequency conversion relay) contact is OFF, low-frequency pulse output starts. Turn it ON to output high-frequency pulse. Pre-set with each volume the following values: F.min, F.max, F.min <--> F.max conversion time T. (See *"Adjustment volume" in Chapter 2*.)

Setting

Adjust volume as follows, using minus driver.

- Set CPU unit to program mode (PROG.).
- With WinGPC S/W force I/O function, turn R1.7 ON and pulse output starts. (SUB input: OFF)
  (When High-speed Counter unit is mounted in slot 0)
- Adjust volume (F.max) while viewing OUT0 waveform on oscilloscope.
- Turn SUB input ON and adjust volume (F.min) as above.
- Conversion time T must be set to the most suitable value by actually operating motor.

NX70 High-speed Counter (NX70-HSC1)

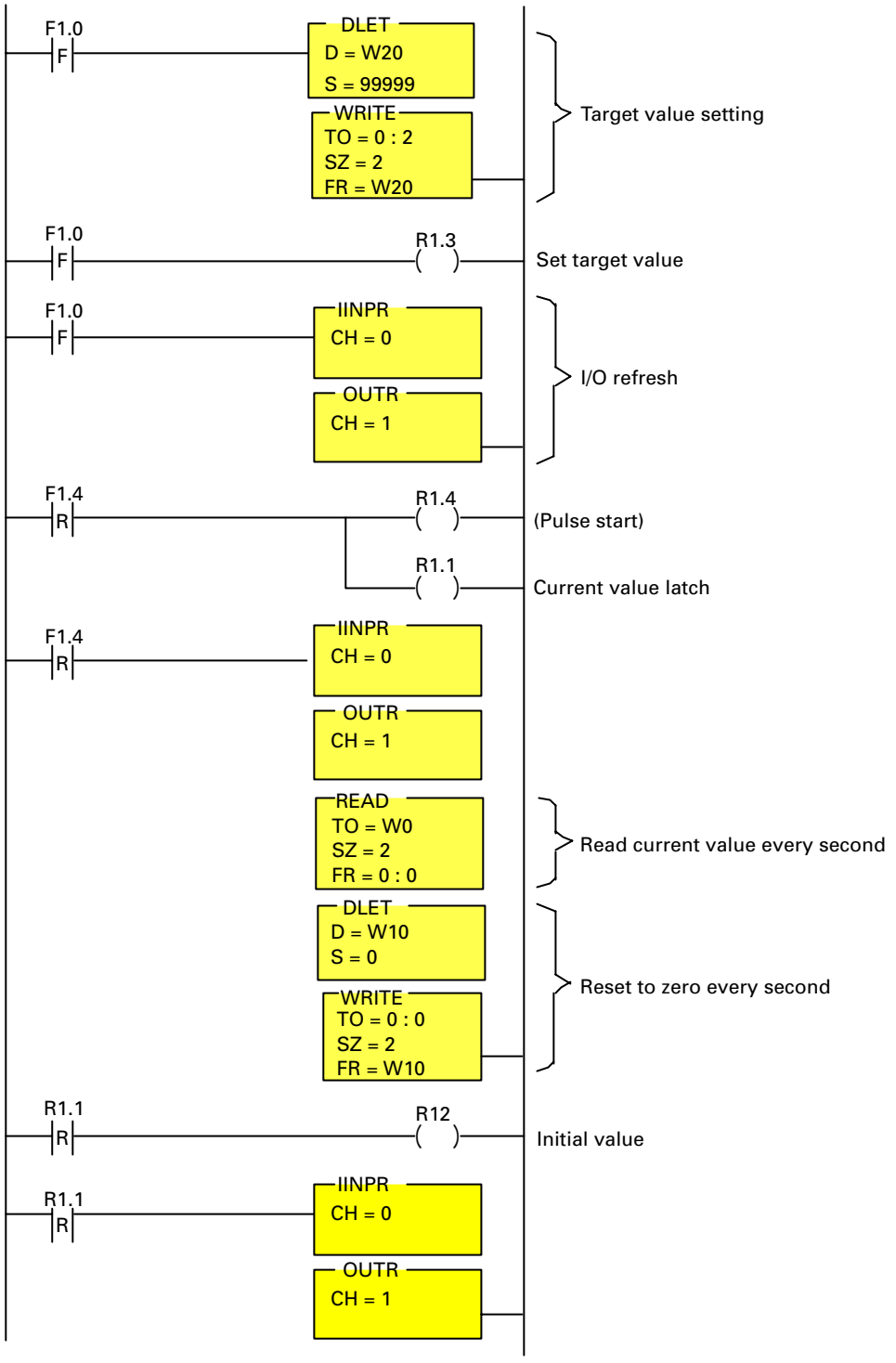


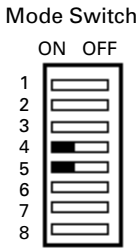
Temporary use example (Frequency temporary measurement program)

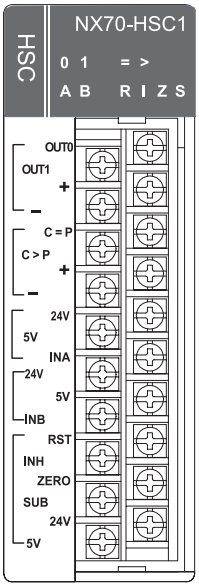
Temporarily measure the frequency of pulse output without devices like oscilloscope. The program below monitors frequency every second, so pulse output frequency can be easily set with this method. (In the example below, High-speed Counter unit is mounted in slot 0.)

Programming

WinGPC S/W







NX70-HSC1

Operation Description

To monitor current value data every second, values similar to output frequency are stored in data register DT0 and DT1.

Data register monitoring is controlled by programming tool, WinGPC.

The example on the previous page outputs lowest frequency F.min. When setting highest frequency F.max, R1.6 must be turned ON by forced output adjustment in RUN mode. **(Force I/O adjustment can be done by programming S/W.)**

Pulse output start, stop condition

- **Start (start output)**

  1. R1.4 (pulse start) is ON.
     Pulse is not output when current value coincides with target value.
  2. R1.7 (return to zero start) is ON. See *"Return to zero mode" in Chapter 2* for more details.

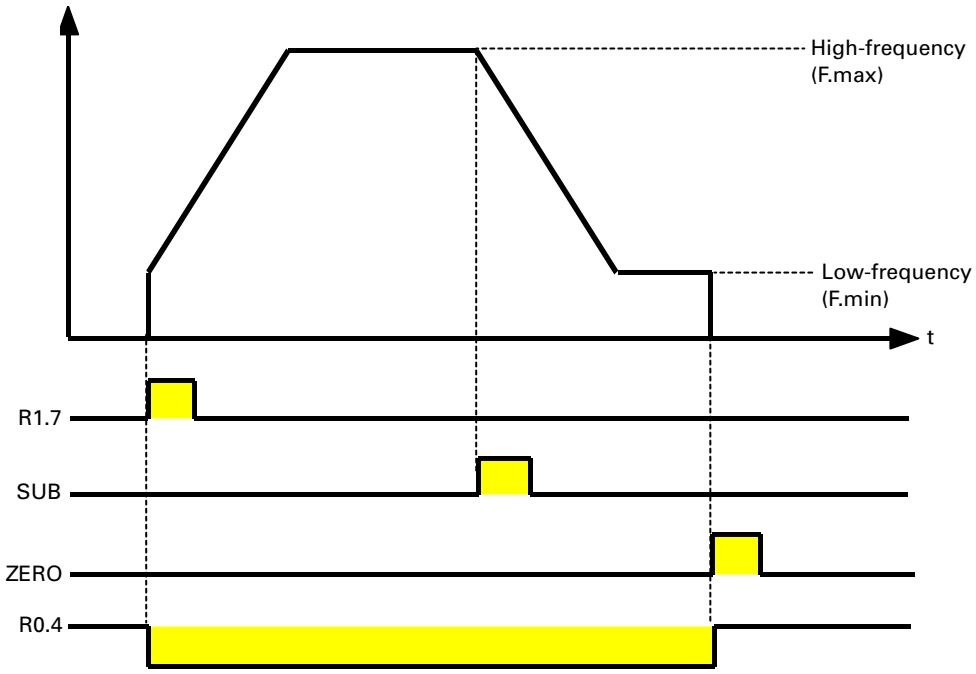
- **Stop (stop output) condition**

  1. Coincidence output (C=P terminal output) is ON
     (In C=P mode, current value coincides with target value
     In C=0 mode, current value is zero.)
  2. RST input is ON.
  3. R1.0 (reset) contact is ON.
  4. In return to zero mode, ZERO input turns ON after SUB input turns ON. See *"Return to zero mode" in Chapter 2* for more detail.

Return to zero mode

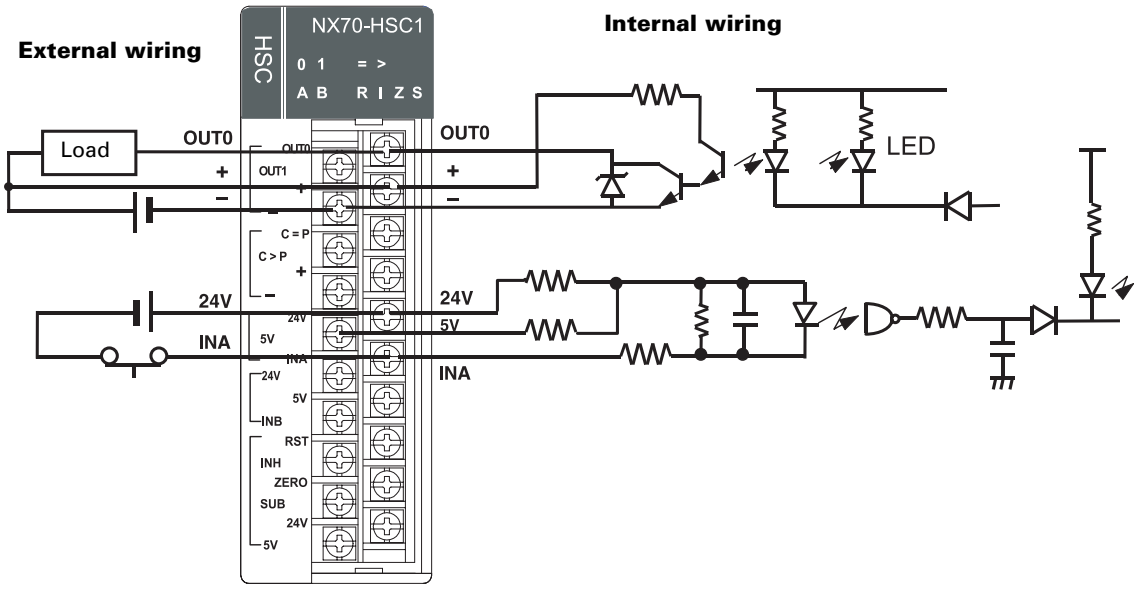
NX70 PLC High-speed Counter (NX70-HSC1) 1CH unit has temporary location decision function for controlling motor with pulse output. In return to zero mode, the following I/O is available.

- **R1.7 (Internal contact)**
  Starting signal of return to zero. If this is ON, this mode is pre-set by mode switch and R1.5 (pulse output selection relay), and pulse output starts from OUT0 or OUT1. Output frequency is set to high-frequency (F.max). Set R1.7 to turn only 1 scan ON during program operation.
- **SUB input**
  When this is ON, output frequency shift from high-frequency (F.max) to low frequency (F.min).
- **ZERO input**
  When this in ON, low-frequency (F.min) output turns OFF. (ZERO input is recognized only after SUB input is ON.)
- **R0.4 (internal contact)**
  Complete signal of return to zero. R0.4 turns ON when zero input turns ON. This contact is retained until return to zero operation starts. When return to zero completes, counter current value is set to undefined, so new data must be defined before the next operation starts.

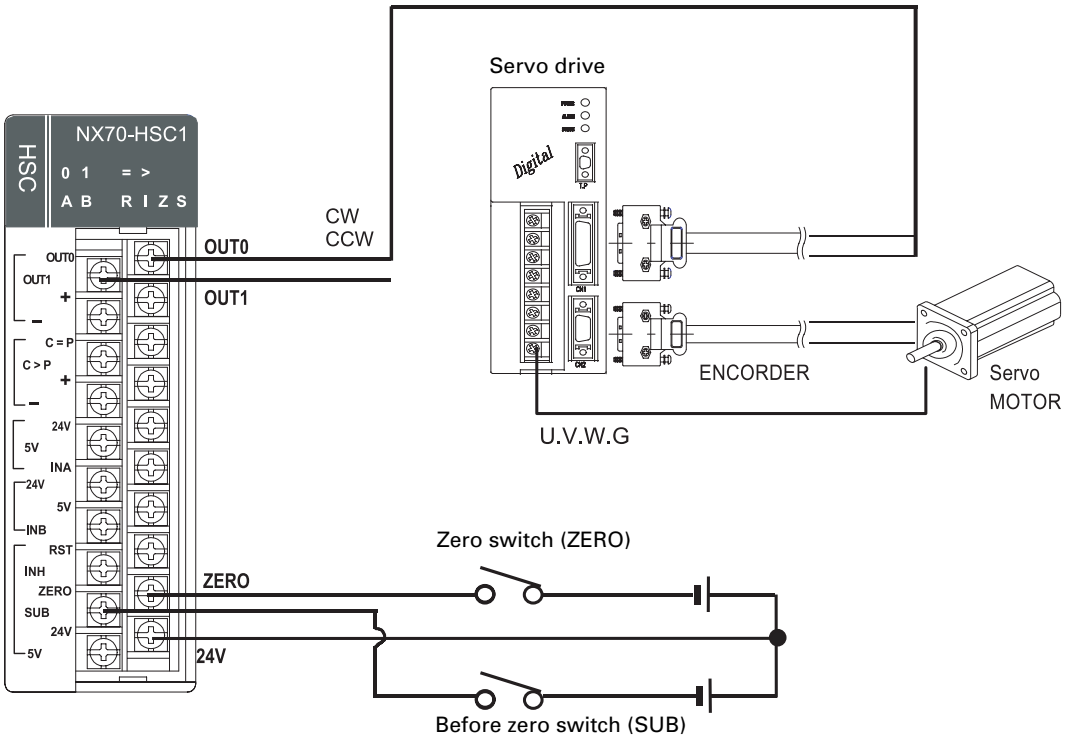


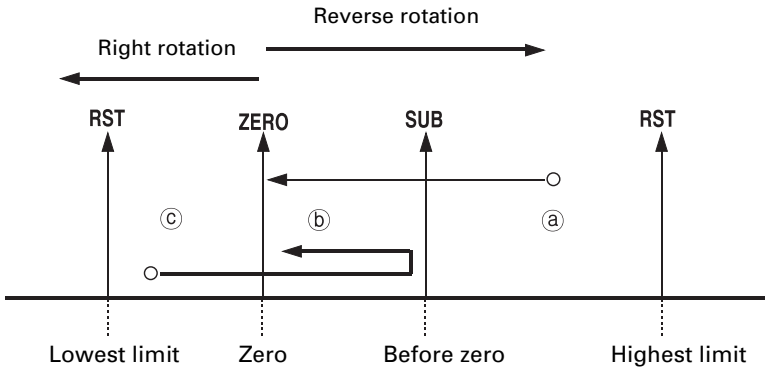
Wiring Diagram

The internal I/O circuit of High-speed Counter unit is as follows:



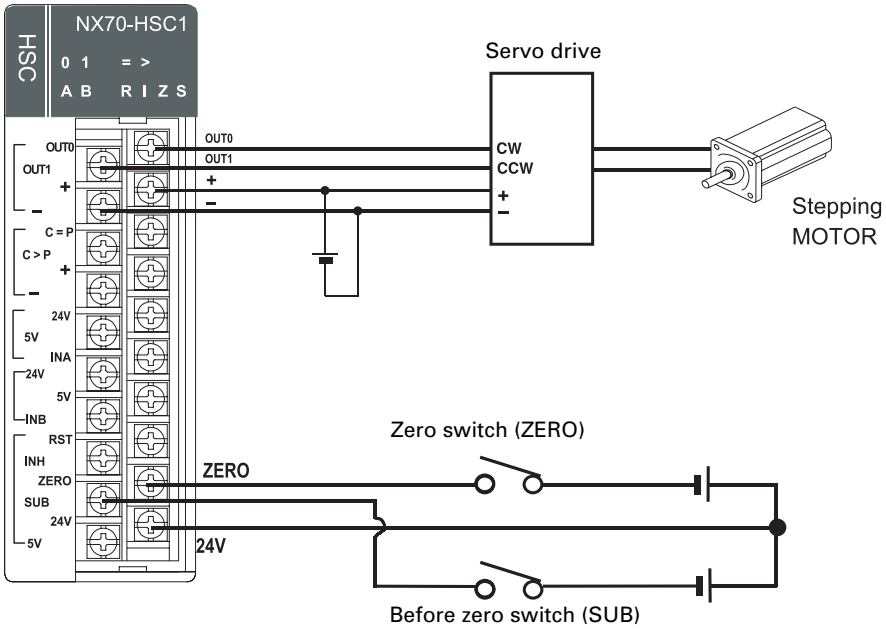
[Wiring example 1] Connection with servo drive

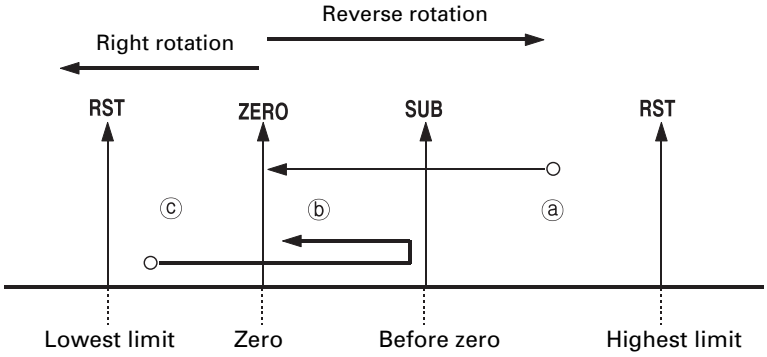




If the control subject is located at ⓐ , the signal passes from SUB to ZERO, so pulse stops at zero. But if it is located at ⓑ or ⓒ, turn it in right direction, and turn it in reverse rotation when SUB is ON.

[Wiring example 2] Connection with stepping motor drive



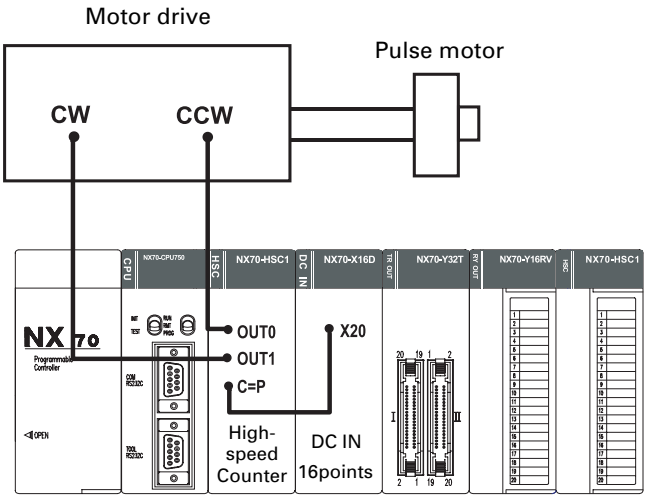


If the control subject is located at ⓐ , the signal passes from SUB to ZERO, so pulse stops at zero. But if it is located at ⓑ or ⓒ, turn it in right direction, and turn it in reverse rotation when SUB is ON.

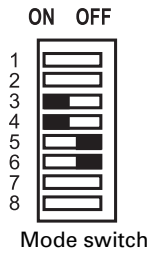
Program example (Pulse motor control example)

Wiring Diagram:

Temporary location decision is enabled with pulse motor or servo motor using pulse output (OUT0, OUT1). This example shows a program that rotates the pulse motor 100,000 pulses in both directions in turn. It is set to slower motor rotation from high-speed to low-speed when the pulse output remains only 3000 pulses.



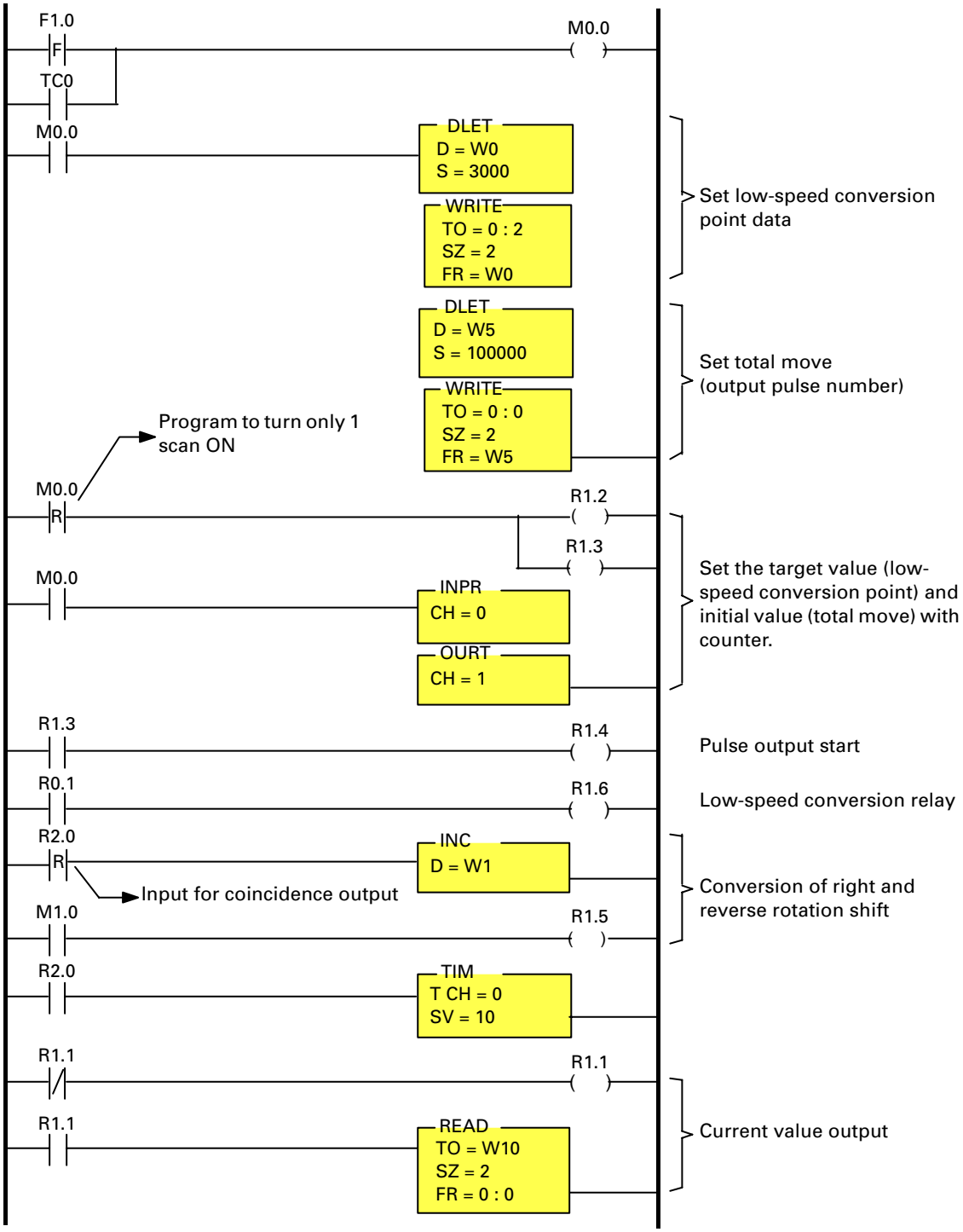
NX70 High-speed Counter (NX70-HSC1)



Mode switch

Program example

WinGPC S/W



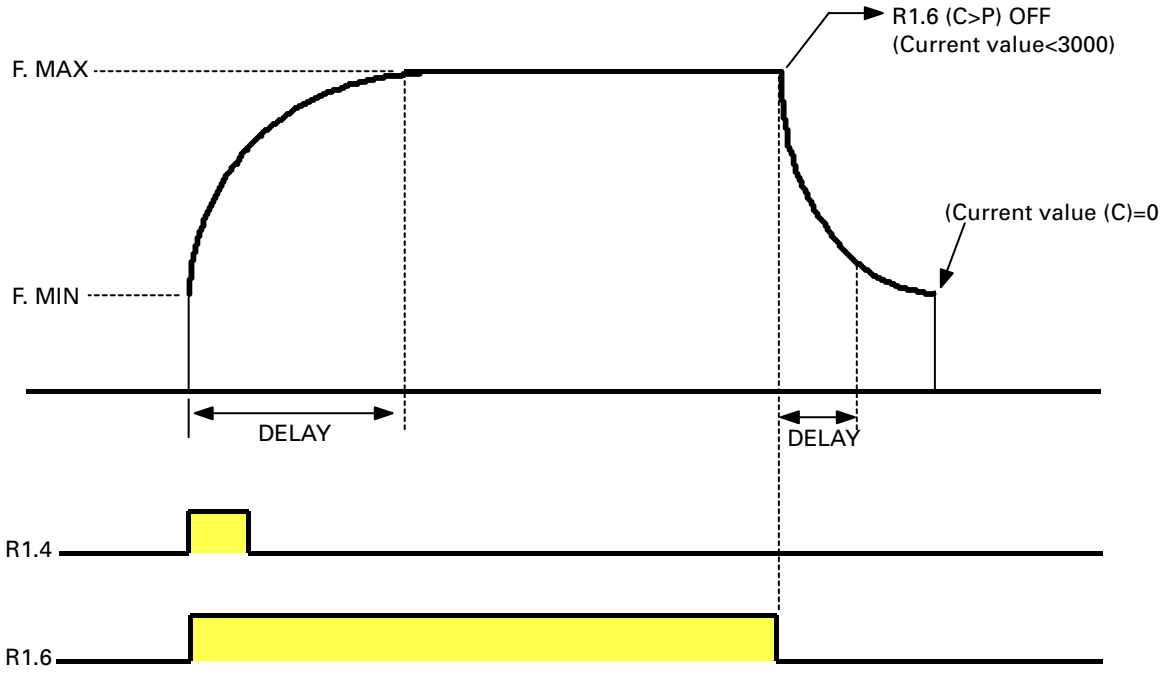
Operation description

In RUN mode, R0 turns ON, and each 32 bit of both low-speed conversion point data as target value area (word address 2 to 3), and total move (output pulse number) as initial value area (word address 0 to 1) is transmitted. (But High-speed Counter unit processes data bit in 24 bit, so the upper 8 bit of transmitted data is not effective.) Turn R1.2 and R1.3 ON to set to internal counter.

In addition, internal program uses I/O refresh instruction (F143, IORF) to promote execution. Start pulse output at OUT0 by turning R1.4 ON after data set to counter. When pulse output starts, course (C) > objective (P) so internal contact relay R0.1 (C > P) turns ON, and pulse output frequency conversion relay R1.6 turns ON, and the output will be high-frequency pulse.

Operation mode is set to internal counter mode, so the output pulse will be automatically counted and when course pulse < objective pulse, R0.1 turns OFF converted to low-frequency, and pulse output stops when current value = 0. The High-speed Counter is in C=0 mode so C=P output exists, so increment instruction is sent, R1.0 turns ON, R1.5(pulse output selection relay) turns ON at the same time, and pulse output starts at OUT1 when next pulse output is set (timer T0 is ON).

Timing Diagram



Specifications and Components

100Kcps fast response High-speed Counter. Easy to monitor and set data of counter values.
Two counter input channels on one unit.

High-speed Counter Unit Features

NX70 High-speed Counter Unit
NX70-HSC2: 2CH Unit

NOTE There is no pulse output function for 2CH type (NX70-HSC2) product

1. 100kcps High-Speed Response
   High-speed response of 100kcps enables high-accuracy speed control.

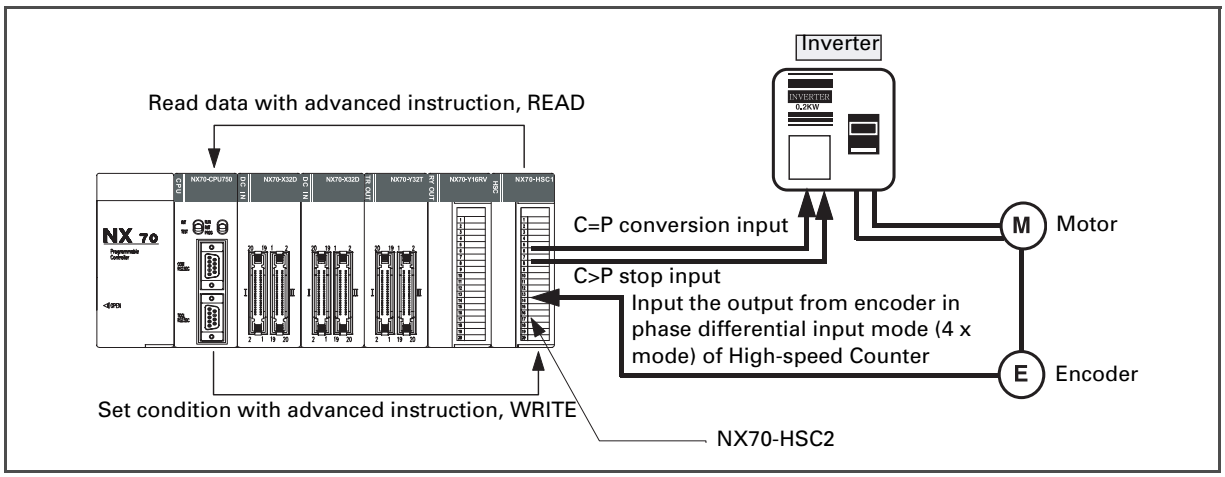
2. Various Input Modes
   Phase differential input mode (1 x, 4 x mode) that can count two-phase pulse of rotary encoder, individual input mode, and direction discrimination input mode are provided (set by DIP switch on the bottom of the unit).

3. Wide Counting Range
   Counting range, formatted as 24-bit signed (binary) integer, covers from -16,777,216 to 16,777,215.

4. Easy to Monitor Counter Measurement and Set Data
   Built-in shared memory helps data read/write at PLC freely.

5. Comparison output and coincidence output
   Can be used as slow-down or stop signal for controlling motor.

[Ex.] Counts rotation from encoder output and compares the rotation number with rotation count set, and sends instructions like conversion or stop to inverter.



General Specifications

Item		Specifications
Temperature	Operating	0 °C to +55 °C (32 °F to 131 °F)
	Storage	-25 °C to +70 °C (-13 °F to 158 °F)
Humidity	Operating	30 to 85% RH (Non-condensing)
	Storage	30 to 85% RH (Non-condensing)
Withstand voltage		500V ac for 1 minute between I/O terminal (dc) and frame ground (power unit)
Insulation resistance		100 MΩ or more at 500 mega V DC between I/O terminal (dc) and frame ground (power unit)
Vibration immunity		10 to 55Hz, 1 cycle/minute: double amplitude of 0.75mm, 10 minutes on 3 axis (X, Y, Z)
Shock immunity		Peak acceleration and duration 15g/11ms, 3 times in each X, Y, Z direction
Noise immunity		1500Vp-p with 50ns to 1μs pulse width (generated by noise simulator)
Ambience		No corrosive gas, no excessive dust

Performance Specifications

Input and Counter Specification

Item		Specifications
Input specification	Number of input points	6 points, (INA, INB, PR/INH) x 2
	Input voltage	5 to 24V DC
	Allowable voltage variation range	4.75 to 25.0V DC
	ON voltage/ current	4.5V or less/3 mA or less
	OFF voltage/ current	1.5V or more/0.6 mA or more
Counter specification	Number of counter channels	2 points (UP-DOWN COUNTER)
	Counting range	24-bit signed integer (binary format) (-16,777,216 to 16,777,215)
	Max. counting speed	100kcps (Recommended counter input: within 30kcps)
	Input mode	3 modes (direction discrimination: Pulse + Direction, individual input: CW, CCW, phase differential input (1 x, 4 x mode)
	Min. input pulse width	5us (individual input)
	Multiplication function	1 x, 4 x mode (phase differential input mode)

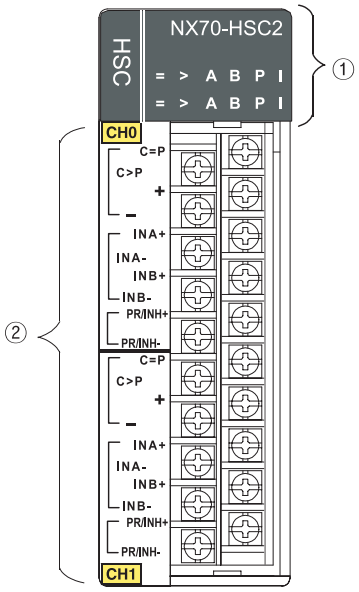
Output Specification

Item		Specifications
General	Isolation method	Photo coupler
	Output format	Transistor output (NPN, open collector)
	Rated use voltage	5 to 24V DC
	Allowable voltage variation range	4.75V to 25V DC
	Max. load current	100 mA
	Residual voltage	0.5V or less
	Leakage current	10 uA
Control output	Number of output points	4 points (C=P, C>P) x 2
	COMMON terminal	2 points/COMMON
	Fuse	N/A
	Response time	OFF -> ON: 10us or less, ON -> OFF: 100us or less

Others

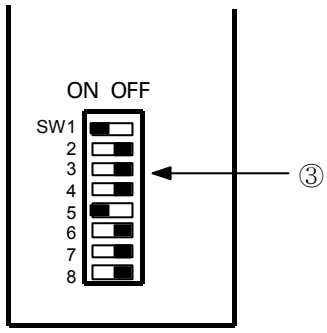
Item	Specifications
Operation indicator	LED
Internal current consumption (5V)	400 mA
External connection method	Terminal block (20-pin)
Suitable cable size	0.5 to 1.25mm^2
Terminal block terminal screw	M3.0 screw
Occupied I/O points	32 points (16R, 16R) (16 points input, 16 points output)

Unit Diagram (NX70-HSC2)



(Front)

1. **Input operation LED**
   Shows ON/OFF status of I/O.
2. **Terminal block (20-pin)**
   Terminal block for I/O and power wiring.
3. **Mode switch**
   DIP switch for shifting counter unit function. Preset as SW1: ON, SW5: ON, others OFF (phase differential input, 4 x mode). (See *"Mode Switch" in Chapter 3*, *"Mode Switch" in Chapter 4*)



(Bottom)

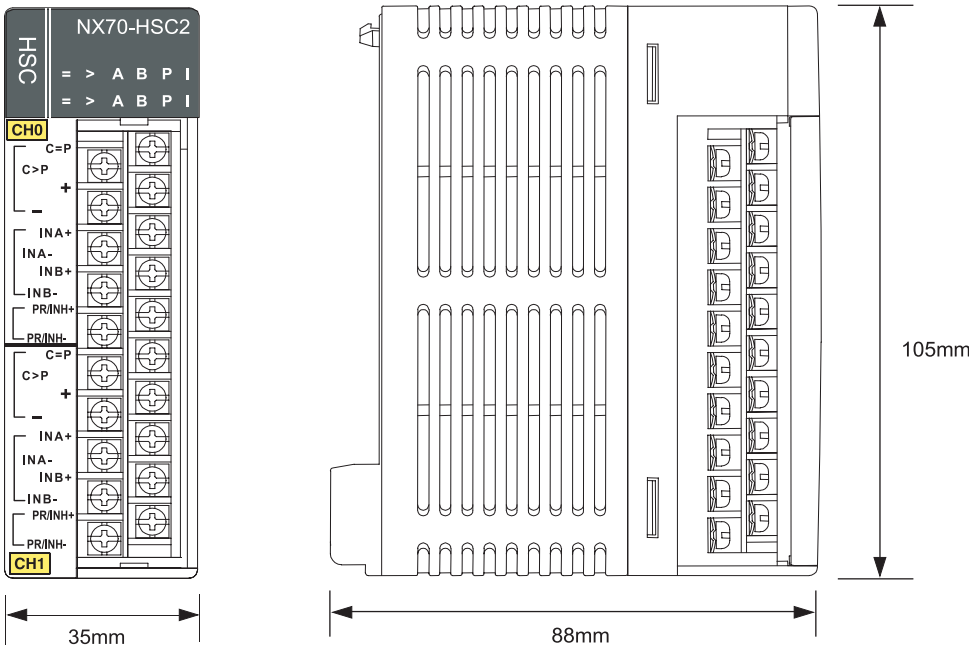
LED indicator

	LED	Description
CH0	=	Current value=Set value or current value=0 (R0.5)
	>	Current value>Set value (R0.1)
	A	INA input
	B	INB input
	P	Preset setting indication
	I	Counter inhibition operation indicator (Inhibit)
CH1	=	Current value=Set value or current value=0 (R0.13)
	>	Current value>Set value (R0.9)
	A	INA input
	B	INB input
	P	Preset setting indication
	I	Counter inhibition operation indicator (Inhibit)

Mode Switch

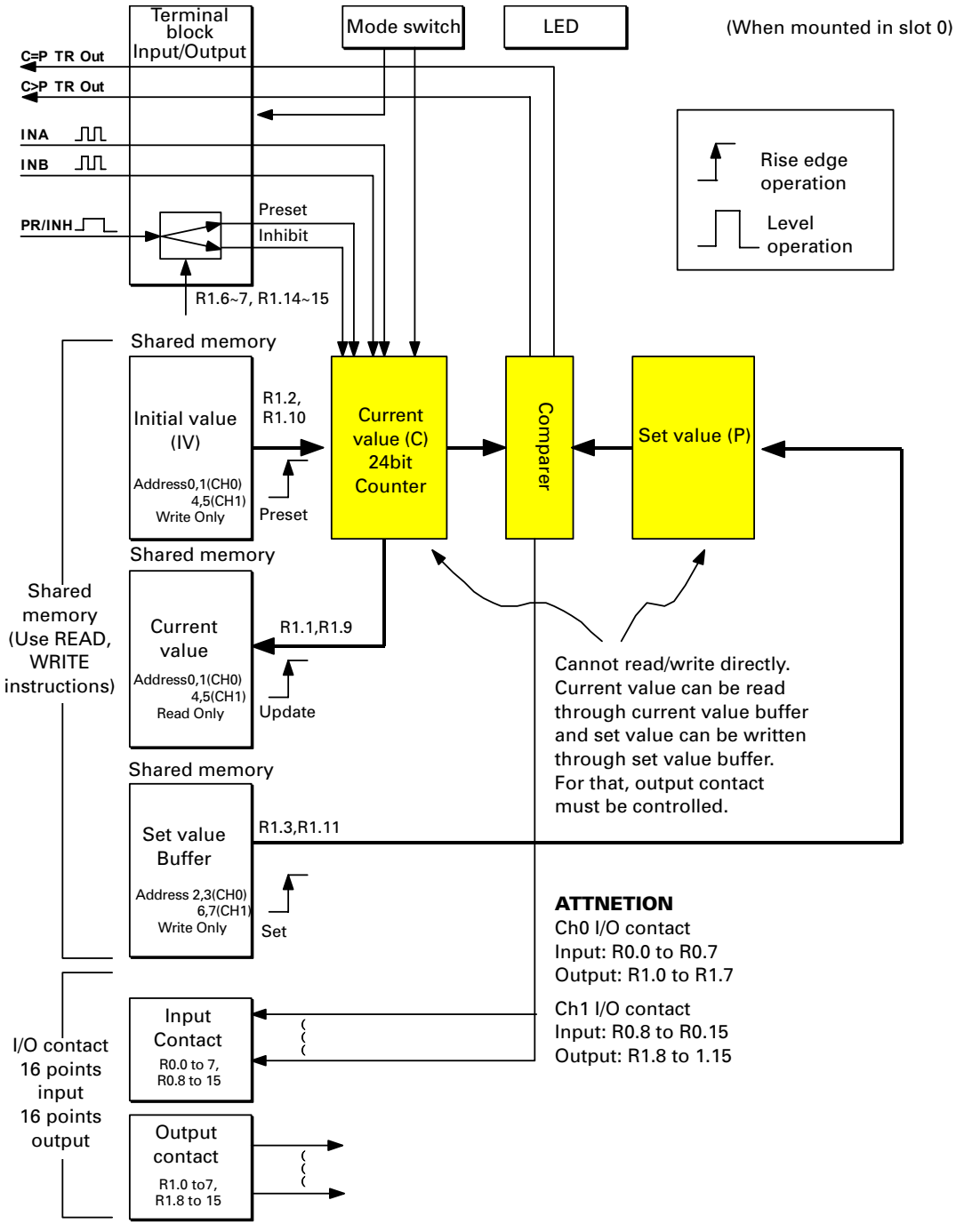
	Switch	Description	Remarks
CH0	SW1 SW2	SW1,2 =OFF,OFF: Direction discrimination input (Pulse+Direction) SW1,2 =OFF,ON: Individual input mode (CW+CCW) **SW1,2 =ON,OFF: Phase differential input mode (2-phase mode), 4 x mode (Recommended)** SW1,2 =ON,ON: Phase differential input mode (2-phase mode), 1 x mode	
	SW3	C=P terminal block output method selection OFF: one short, ON: retentive output	Non-retnetive output time is 100 ms ±30%
	SW4	C=P terminal block output selection OFF: current value=set value, ON: current value=0	
CH1	SW5 SW6	SW5,6 =OFF,OFF: Direction discrimination input (Pulse+Direction) SW5,6 =OFF,ON: Individual input mode (CW+CCW) **SW5,6 =ON,OFF: Phase differential input mode (2-phase mode), 4 x mode (Recommended)** SW5,6 =ON,ON: Phase differential input mode (2-phase mode), 1 x mode	
	SW7	C=P terminal block output method selection OFF: One short, ON: Retentive output	Non-retnetive output time is 100 ms ±30%
	SW8	C=P terminal block output selection OFF: When current value = set value, ON: When current value=0	

Dimensions



Operation Description

Counter Architecture



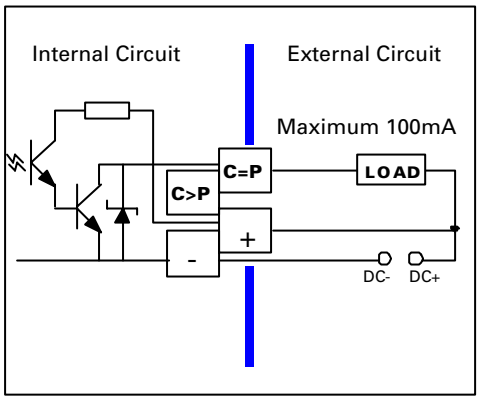
Terminal Block I/O

C: Current value, P: Set value

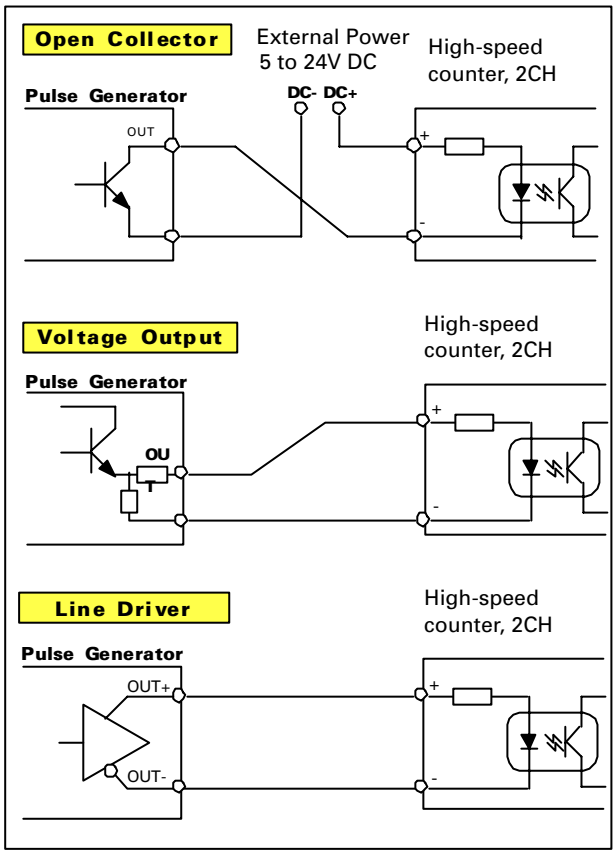
	Terminal block indication	Description	Remarks
CH0	C=P	Current value=Set value or current value=0, One short/retentive output setting available.	TR output maximum 100 mA
	C>P	Current value >Set value	TR output maximum 100 mA
	+	5 to 24 V DC, TR output power	
	-	0V DC, TR output power	
	INA+ INA-	INA+ input	
		INA- input	
	INB+ INB-	INB+ input	
		INB- input	
	PR/INH+ PR/INH-	Inhibition Function when R1.6=ON Preset Function when R1.7=ON	Preset Function (Initial value Current value)
CH1	C=P	Current value=Set value or current value=0 One short/retentive output setting available	TR output maximum 100 mA
	C>P	Current value > Set value	TR output maximum 100 mA
	+	5 to 24V DC, TR output power	
	-	0V DC, for TR output power	
	INA+ INA-	INA+ input	
		INA- input	
	INB+ INB-	INB+ input	
		INB - input	
	PR/INH+ PR/INH-	Inhibition Function when R1.14=ON Preset Function when R1.15=ON	Preset Function (Initial value current value)

Terminal Block I/O Wiring

C = P, C > P output

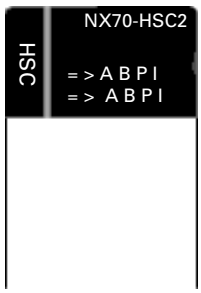


INA, INB, PR/INH input



LED

	LED	Description
CH0	=	Current value=Set value or current value=0 (R0.5)
	>	Current value>Set value (R0.1)
	A	INA input
	B	INB input
	P	Preset setting indication
	I	Inhibit indication
CH1	=	Current value=Set value or current value=0 (R 0.13)
	>	Current value>Set value (R0.9)
	A	INA input
	B	INB input
	P	Preset setting indication
	I	Inhibit indication



When "=" sign on LED appears, refer to mode switch.

I/O Contact

High-Speed Counter Unit 2CH(NX70-HSC2) occupies 16 points input and 16 points output, totaling 32 points.

This manual describes CH0 use. For CH1, set to suitable contact addresses.

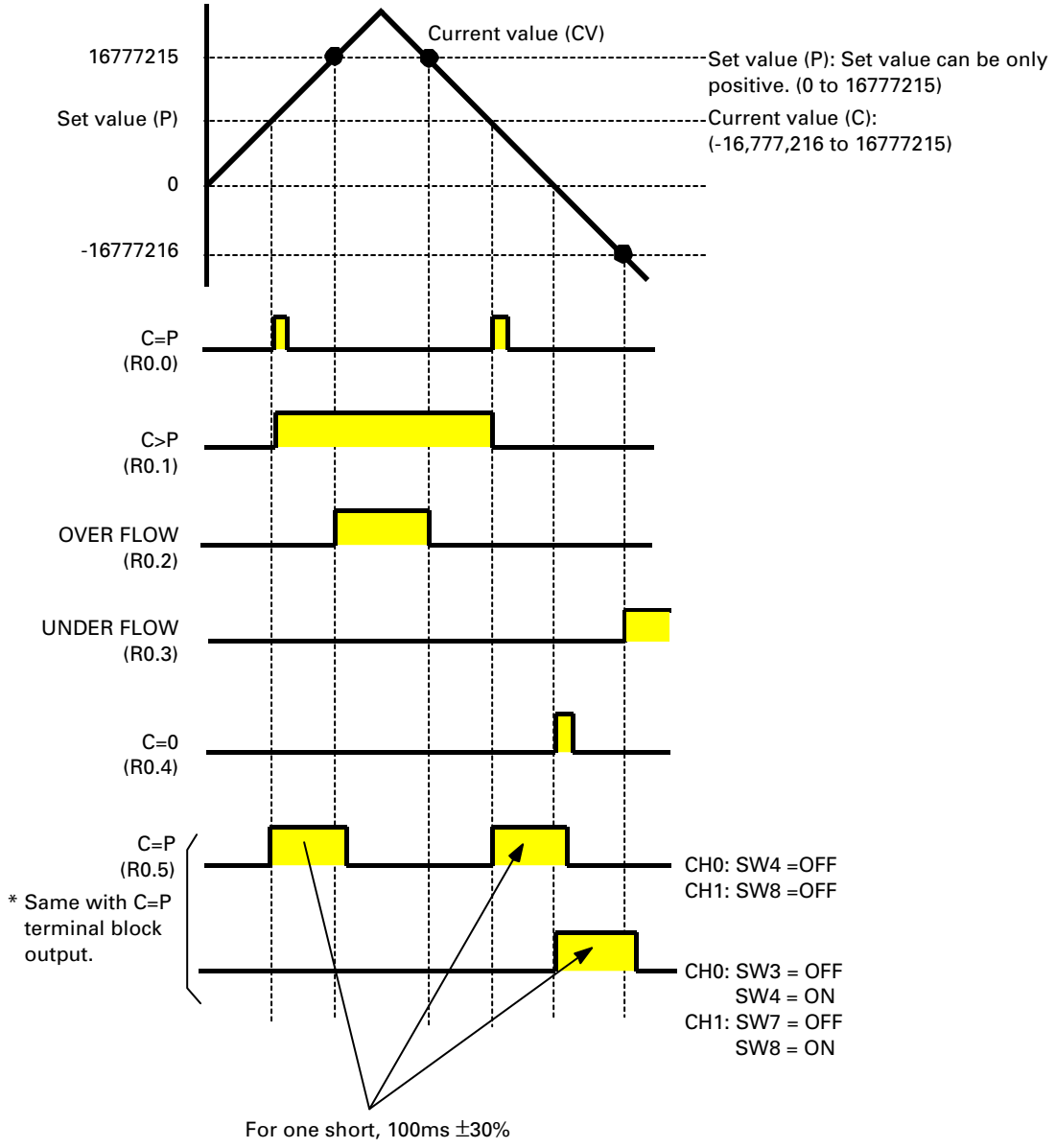
Input contact

	Input contact address	Description	Remarks
CH0	R0.0	Current value=Set value (C=P)	Comparer output
	R0.1	Current value>Set value (C>P)	Comparer output, same with C>P terminal block TR output
	R0.2	Overflow	Comparer output
	R0.3	Underflow	Comparer output
	R0.4	Current value=0 (C=0)	Comparer output
	R0.5	C=P hardware output	Same with C=P terminal block TR output
	R0.6	PR/INH input	Same with PR/INH terminal block input
	R0.7	Retentive PR/INH input	PR/INH terminal block input is set during rise edge.
CH1	R0.8	Current value=Set value (C=P)	Comparer output
	R0.9	Current value>Set value (C>P)	Comparer output, same with C>P terminal block TR output
	R0.10	Overflow	Comparer output
	R0.11	Underflow	Comparer output
	R0.12	Current value=0 (C=0)	Comparer output
	R0.13	C=P hardware output	Same with C=P terminal block TR output
	R0.14	PR/INH input	Same with PR/INH terminal block input
	R0.15	Similar PR/INH input	PR/INH terminal block input is set during rise edge.

- **R0.0 to R0.4, R0.8 to R0.12: Comparer flag**
  When operating with comparison relay from R0.0 to R0.4, CPU unit scan time must be considered as below. When scan time is long, operation will be delayed. Specifically R0.0 [C=P] turns on only when the current value coincides with target value, so if the ON time is short it may not be input to CPU unit. In such cases, connect external output (C=P) to other input unit and input to CPU unit, or use R0.5 (same with terminal block output C=P).
- **R0.5, R0.13: Coincidence output flag**
  Same signal as external output terminal C=P. Either 100 ms ON output or Retentive output can be selected using the mode switch. R0.5 output is synchronized with input pulse, so when course and target value coincides at zero, like in the case of power input, output is disabled.
- **R0.6, R0.14: Same with PR/INH terminal block input**
- **R0.7, R0.15: Retained as latched during rise edge of PR/INH terminal block input.**

Relation between internal contact relay and current value R0.0 to R0.4

(Description below applies to CH0. For CH1, see the previous page for CH1 contact relay number.)



Output contact

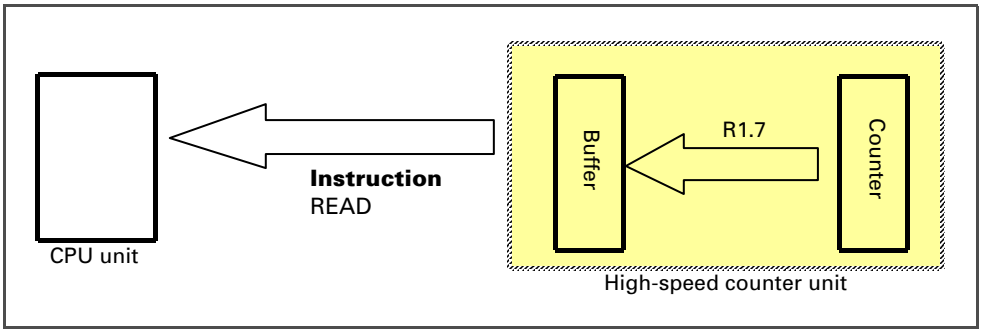
	Output contact address	Description	Operation	Remarks
CH0	R1.0	Counter initialization	Level operation	
	R1.1	Current value buffer update (Current value → Current value buffer)	Rise edge	
	R1.2	Preset (Initial value → Current value)	Rise edge	
	R1.3	Set value (Set value buffer → Set value)	Rise edge	
	R1.4	Ring counter	Level operation	(If current value=set value) Initial value → Current value
	R1.5	Retentive remove R0.5, R0.7	Rise edge	Remove retentive flag of input contact
	R1.6	Use inhibition function	Level operation	When terminal block input is set to PR/INH, counter is set to count inhibition.
	R1.7	Use preset function	Level operation	The current value is set to the initial value (i.e., presetting occurs) on the rising edge of the terminal block input PR/ INH.
CH1	R1.8	Counter initialization	Level operation	
	R1.9	Current value buffer update (Current value → current value buffer)	Rise edge	
	R1.10	Preset (Initial value → Current value)	Rise edge	
	R1.11	Set value (Set value buffer → Set value)	Rise edge	
	R1.12	Ring counter	Level operation	(If current value=set value) Initial value →Current value
	R1.13	Retentive remove R0.13, R0.15	Rise edge	Remove retentive flag of input contact
	R1.14	Use inhibition function	Level operation	When terminal block input is set to PR/INH, counter is set to count inhibition.
	R1.15	Use preset function	Level operation	The current value is set to the initial value (i.e., presetting occurs) on the rising edge of the terminal block input PR/ INH.

R1.0, R1.8: Counter initialization

Initialize inside of high-speed counter. Counter does not operate when R1.0 contact is ON, so turn it OFF when counter operation is needed again.

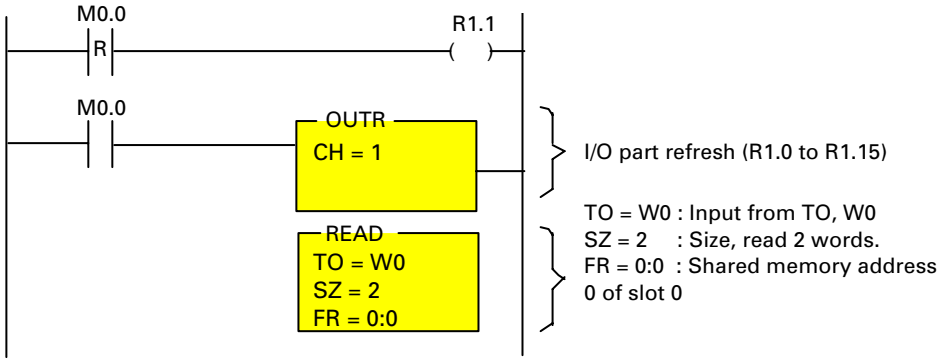
R1.1, R1.9: Counter current value input

When this output contact is ON, current value at the counter is sent to the inside buffer of the counter.
Data READ is executed with transmission instruction. (READ instruction) When R1.1 is not ON and current value is read, the inside buffer of high-speed counter is not written so the previous input data will be read.

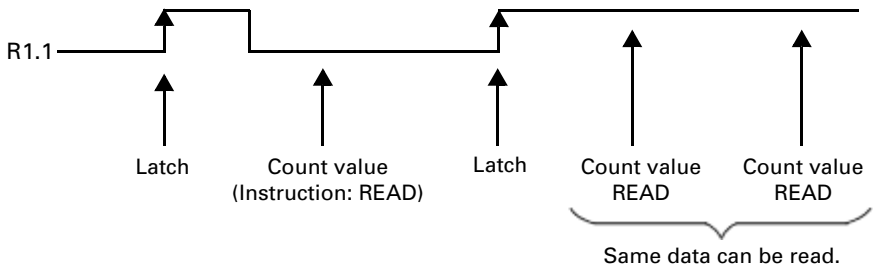


Program Example 1)

When high-speed counter (NX70-HSC2) is mounted in slot 0 and counter current value is sent to W0 and W1



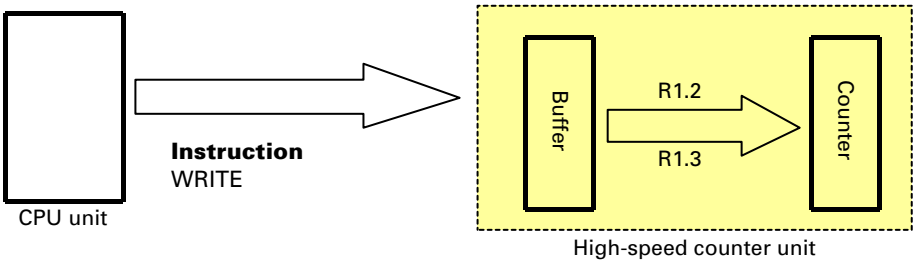
When M0.0 is ON, R1.1 is turned ON by I/O part refresh and two words of counter current value (address 0 to 1) are sent to W0 to W1. When outputting converted current value, turn R1.1 OFF and ON again.



R1.2, R1.10: Preset (Initial value → Current value)

R1.3, R1.11: Set value (Set value buffer → Set value)

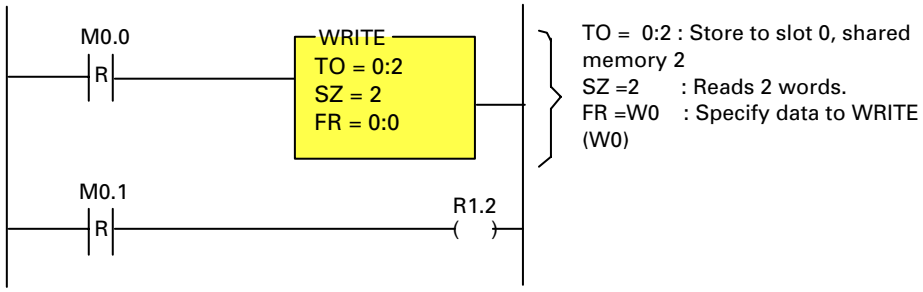
By transferring the data in the internal buffer of the high-speed counter which were received in advance, it sets the curtent value to the initial value and the target value to the value in the target value buffer on the rising edge (OFF → ON) of the output contact.



In addition, when R1.2 is turned ON, coincidence output (C=P) is turned OFF at the same time.

Program Example 2)

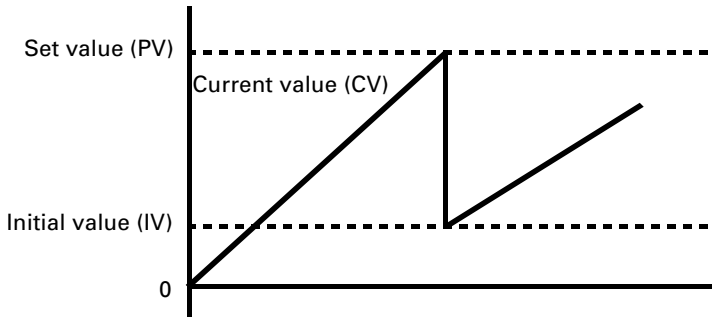
When high-speed counter (NX70-HSC2) is mounted in slot 0 and set W0 and W1 data as the initial value of high-speed counter CH0.



(Note) When resetting initial and target values, turn R1.2 and R1.3 OFF and ON again. Turn only 1 scan ON as shown above.

R1.4, R1.12: Ring counter

When R1.4 output contact is ON and current value coincides with set value, the initial value is automatically sent to current value.



R1.5, R1.13: Retentive Remove

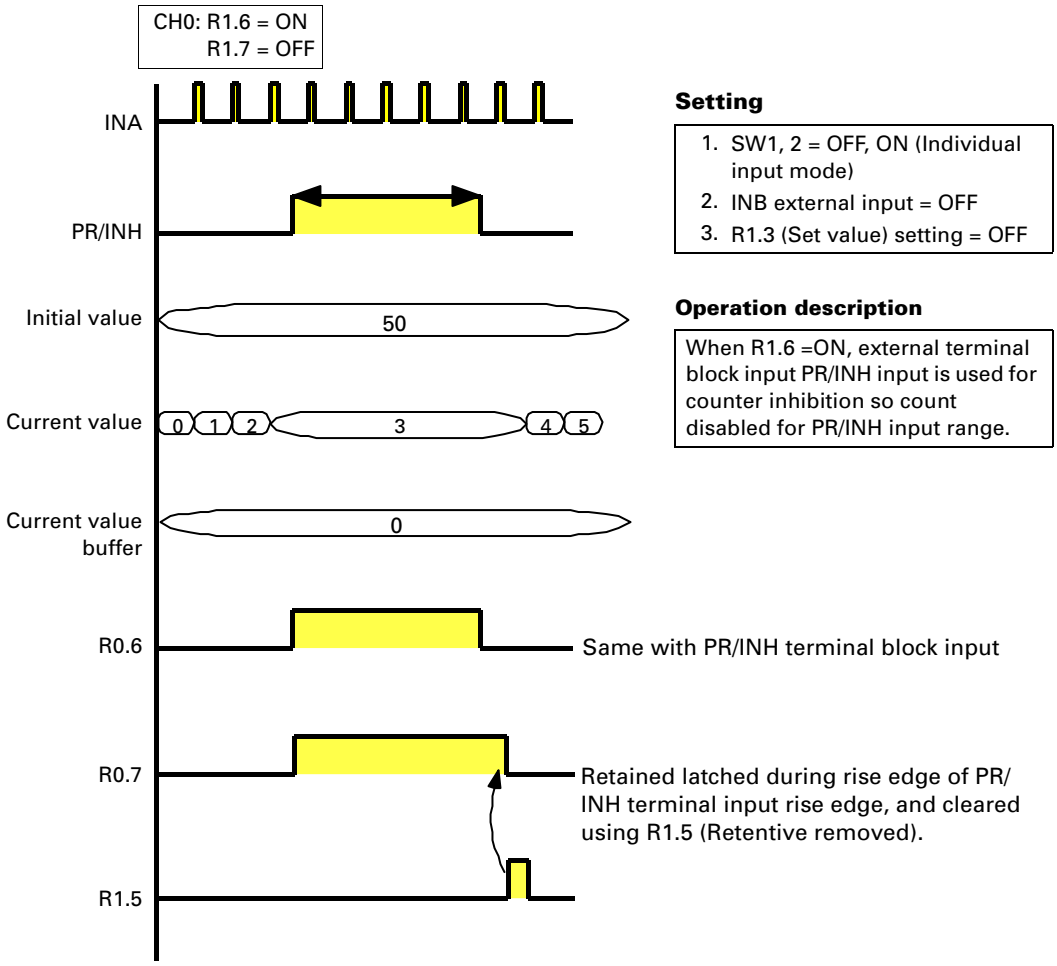
The values retained at R0.5 and R0.7 will be cleared on the rising edge (OFF → ON) of the output contact R1.5.

R1.6, R1.14: Use counter inhibition function

R1.7, R1.15: Use preset function

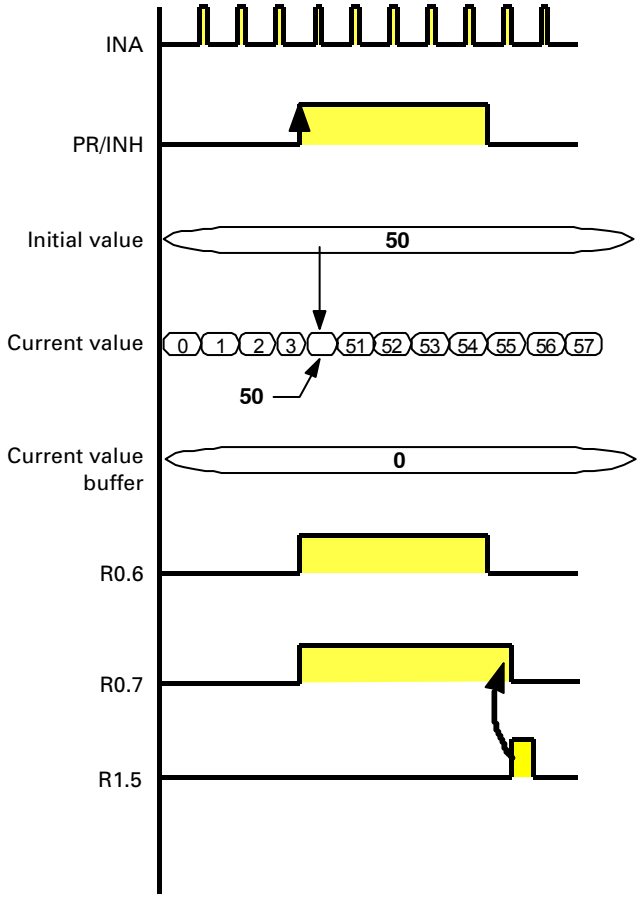
Set external input PR/INH of terminal block to counter inhibition and preset.

Only counter inhibition function



Only preset function

CH0: R1.6 = OFF
R1.7 = ON



What is preset?
Preset means initial value sent to current value by external input or contact control.

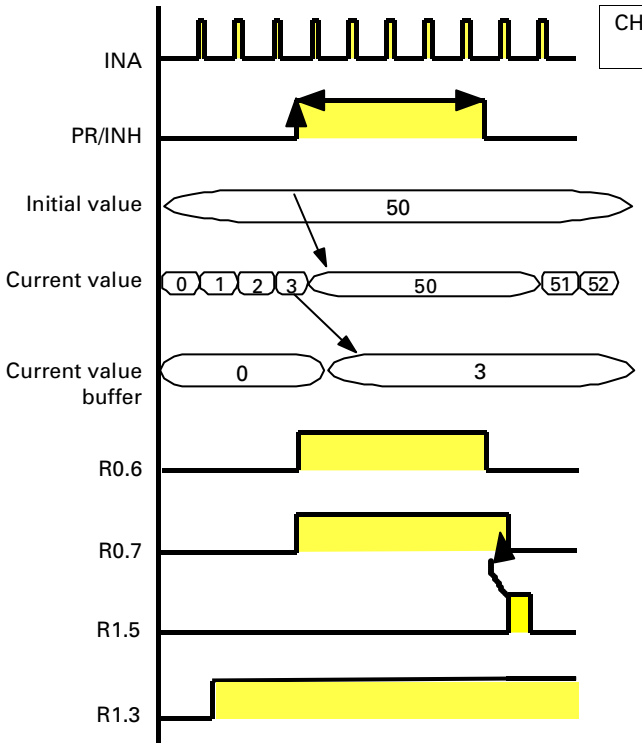
Setting

4. SW1, 2 = OFF, ON (Individual input mode)
5. INB external input = OFF
6. R1.3 (Set value setting) = OFF

Operation description

When R1.7=ON, external terminal block input PR/INH is used for preset function, and initial value is sent to current value and counted during rise edge of PR/NH input rise edge.

Counter inhibition and preset functions



CH0: R1.6 = ON
R1.7 = ON

setting

SW1,2 = OFF, ON (Individual input mode)
INB external input = OFF

Operation description

When R1.6 =ON and R1.7 =ON, external terminal input "PR/INH" is used both for counter inhibition and preset, and initial value is sent to current value during rise edge of external terminal "PR/INH" input rise edge and is not counted in ranges where PR/INH input is ON. When PR/INH is input in ranges where R1.3 is ON, the current value at the time is automatically sent to current value buffer.

ATTENTION

- When R1.3 is ON, current value is sent to current value buffer during rise edge of PR/INH input regardless of use of counter inhibition or preset function. With this function, you can read counter value until high-speed external sensor is input. R1.3 can be used for sending set value.
- R0.6 operates as same with external input PR/INH.
- R0.7 is retained as latched on rise edge of PR/INH regardless of use of counter inhibition or preset function, and can be cleared by using R1.5 (Retentive removed).
- Current value buffer update, current value → current value buffer
  : Rise edge of R1.1 rise edge
  : R1.3 =ON and rise edge of PR/INH terminal block input
- Set value buffer → set value transmission: Rise edge of R1.3
- Initial value → Current value (preset) transmission: Rise edge of R1.2
  : When R1.7 =ON, rise edge of PR/INH rise edge
  : R1.4 =ON and current value coincides with set value
- Clear R0.5: Sending set value by rise edge of R1.3 rise edge
  : Removing retentive by rise edge of R1.5 rise edge

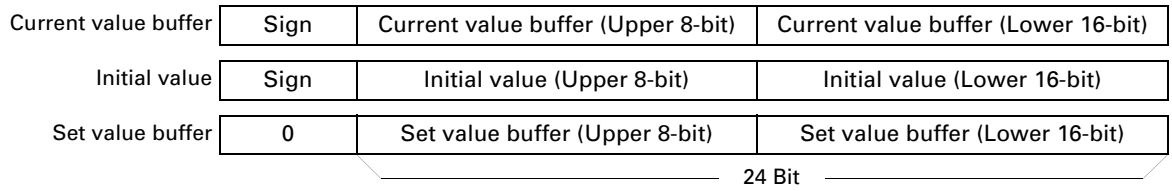
I/O Data (Word)

NX70 PLC High-Speed Counter 2CH (NX70-HSC2) can READ initial value, set value buffer and current value for CPU unit. Each data (current value buffer initial value, set value buffer) consists of 32-bit and is segmented as shown in the table below. Data I/O is controlled by READ, WRITE instructions.

Shared memory MAP of high-speed counter

Instruction Word address		READ	WRITE	Remarks
CH0	0	Current value buffer (Lower 16-bit)	Initial value (Lower 16-bit)	
	1	Current value buffer (Upper 8-bit and sign)	Initial value (Upper 8-bit and sign)	
	2	------	Set value buffer (Lower 16-bit)	
	3	------	Set value buffer (Upper 8-bit (only positive sign))	
CH1	4	Current value buffer (Lower 16-bit)	Initial value (Lower 16-bit)	
	5	Current value buffer (Upper 8-bit and sign)	Initial value (Upper 8-bit and sign)	
	6	------	Set value buffer (Lower 16-bit)	
	7	------	Set value buffer (Upper 8-bit (only positive sign))	

Data configuration



* For set value buffer, "$ FF" value cannot be used for MSB 8-bit.

Data Range (Hex is indicated with $ mark before numbers.)

Current value, current value buffer: -16,777,216 to 16,777,215 ($FF000000 to $00FFFFFF)

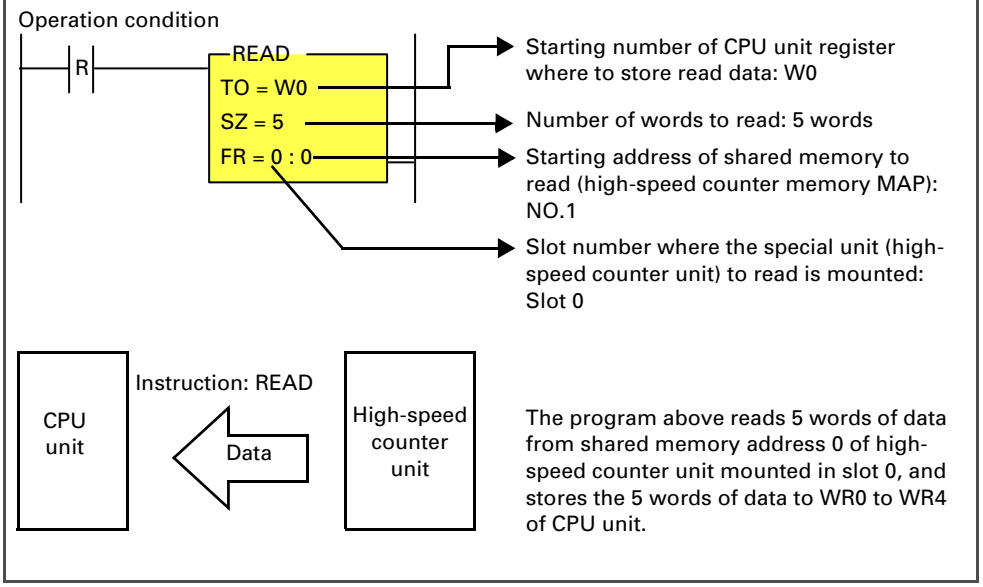
Initial value: -16,777,216 to 16,777,215 ($FF000000 to $00FFFFFF)

Set value, set value buffer: 0 to 16,777,215 ($00000000 to $00FFFFFF)

Advanced Instructions

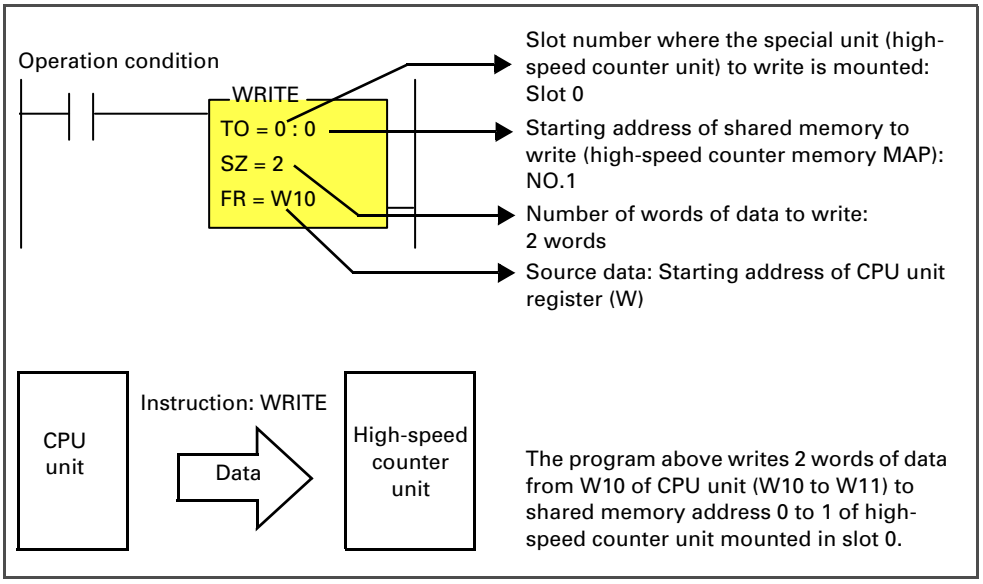
Instruction: READ

Program example where NX70-HSC2 is mounted in slot 0 and only CH0 is being used.


Operation condition
R
READ
TO = W0
SZ = 5
FR = 0 : 0
Starting number of CPU unit register where to store read data: W0
Number of words to read: 5 words
Starting address of shared memory to read (high-speed counter memory MAP): NO.1
Slot number where the special unit (high-speed counter unit) to read is mounted: Slot 0
CPU unit
Instruction: READ
Data
High-speed counter unit
The program above reads 5 words of data from shared memory address 0 of high-speed counter unit mounted in slot 0, and stores the 5 words of data to WR0 to WR4 of CPU unit.

Instruction: WRITE

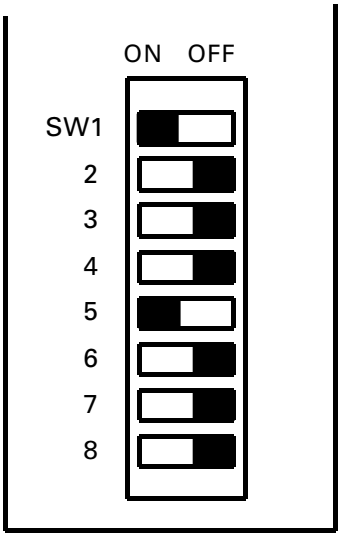
Program example where NX70-HSC2 is mounted in slot 0 and only CH0 is being used


Operation condition
WRITE
TO = 0 : 0
SZ = 2
FR = W10
Slot number where the special unit (high-speed counter unit) to write is mounted: Slot 0
Starting address of shared memory to write (high-speed counter memory MAP): NO.1
Number of words of data to write: 2 words
Source data: Starting address of CPU unit register (W)
CPU unit
Instruction: WRITE
Data
High-speed counter unit
The program above writes 2 words of data from W10 of CPU unit (W10 to W11) to shared memory address 0 to 1 of high-speed counter unit mounted in slot 0.

Mode Switch

Mode switch on the bottom of high-speed counter unit (NX70-HSC2) determines the following functions. DIP switch consists of 8 switches. SW7 and SW8 are not used.

As default, DIP switch is set as SW1: ON, SW5: ON and the others are OFF (phase differential input, 4 x mode) as shown on the right.



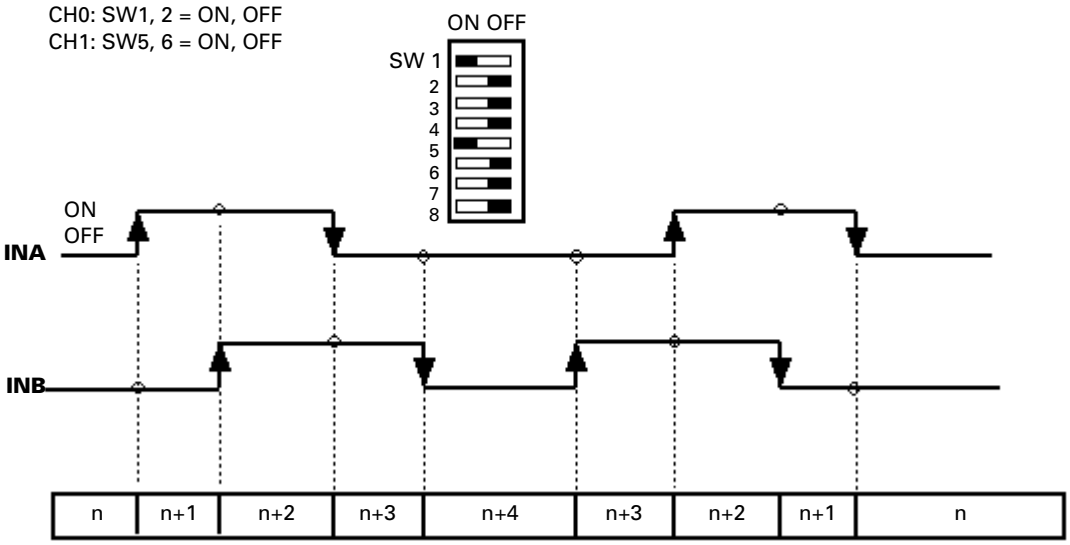
High-speed counter unit (NX70-HSC2) bottom (Mode switch)

Function of each switch is as follows:

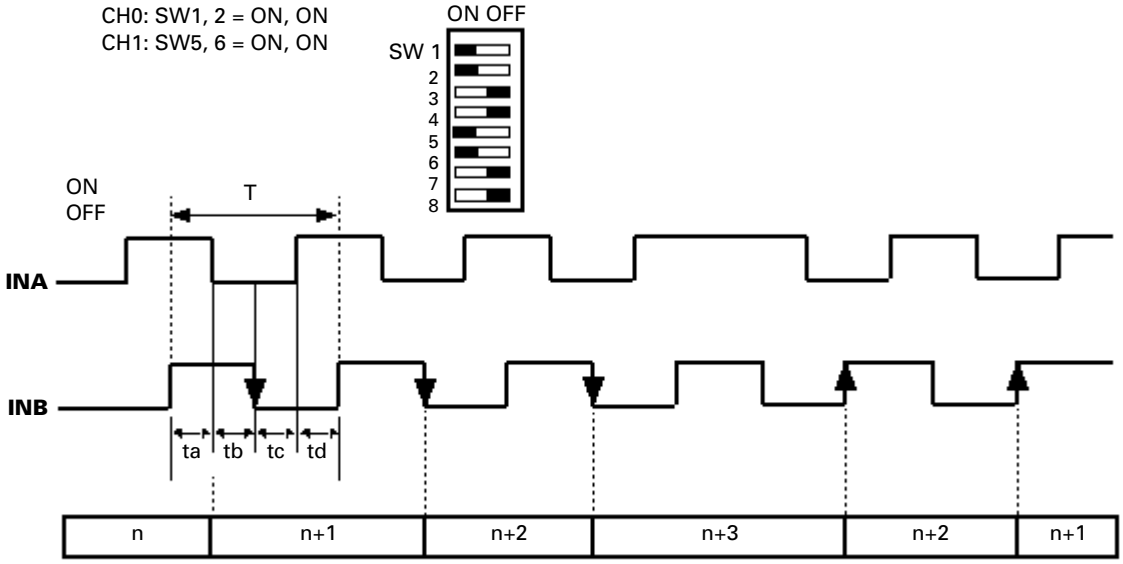
	Switch	Description	Remarks
CH0	SW1 SW2	SW1,2 =OFF,OFF: Direction discrimination input (Pulse + Direction) SW1,2 =OFF,ON: Individual input mode (CW+CCW) **SW1, 2 =ON, OFF: Phase differential input mode (2 phase mode), 4 x mode (Recommended)** SW1,2 =ON,ON: Phase differential input mode (2-phase mode), 1 x mode	
	SW3	C=P terminal block output method selection OFF: one short, ON: retentive output	Non-retnetive output time is 100 ms ±30%
	SW4	C=P terminal block output selection OFF: current value=set value, ON: current value=0	
CH1	SW5 SW6	SW5,6 =OFF,OFF: Direction discrimination input (Pulse + Direction) SW5,6 =OFF,ON: Individual input mode (CW+CCW) **SW5,6 =ON,OFF: Phase differential input mode (2 phase mode), 4 x mode (Recommended)** SW5,6 =ON,ON: Phase differential input mode (2-phase mode), 1 x mode	
	SW7	C=P terminal block output method selection OFF: One short, ON: retentive output	Non-retnetive output time is 100 ms ±30%
	SW8	C=P terminal block output selection OFF: ON when current value = set value, ON: When current value=0	

Input Mode

Phase differential input mode (2-phase mode), 4 x mode:
Usually this mode is recommended. (noise countermeasure)
(You must use this mode when counting encoder output.)

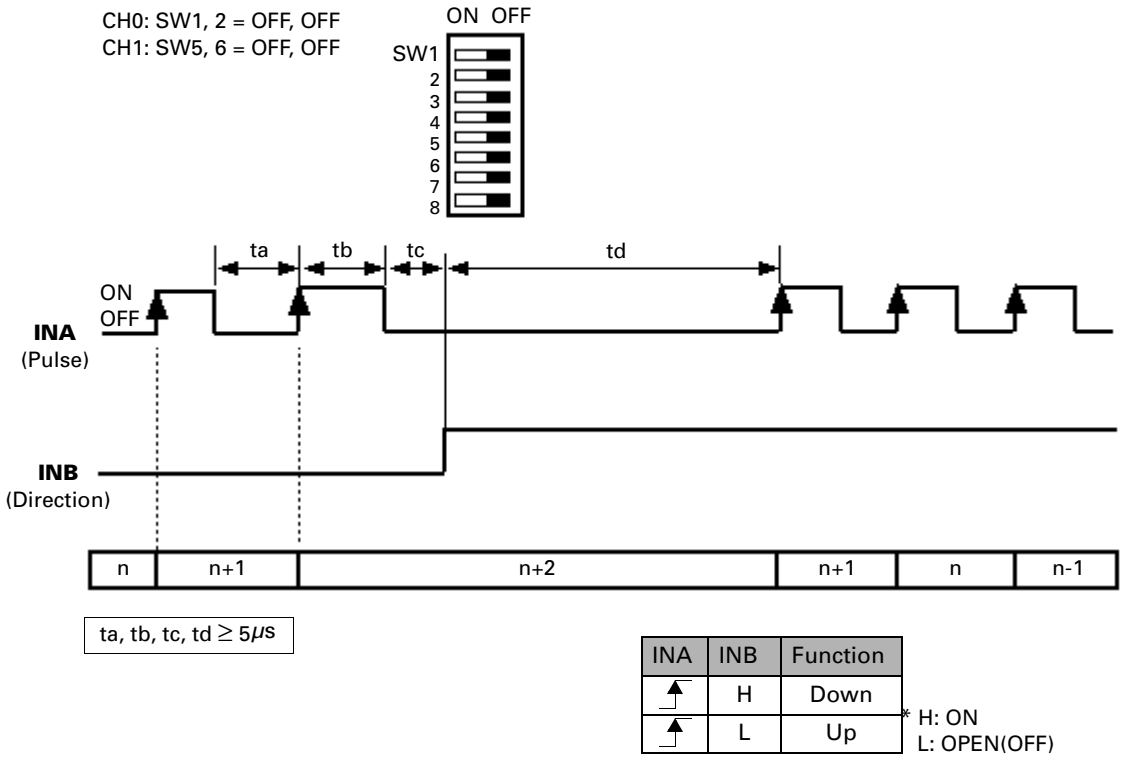


Phase differential input mode (2-phase mode), 1 x mode



ta. tb. tc. td ≥ 1/8T
T ≥ 10 us

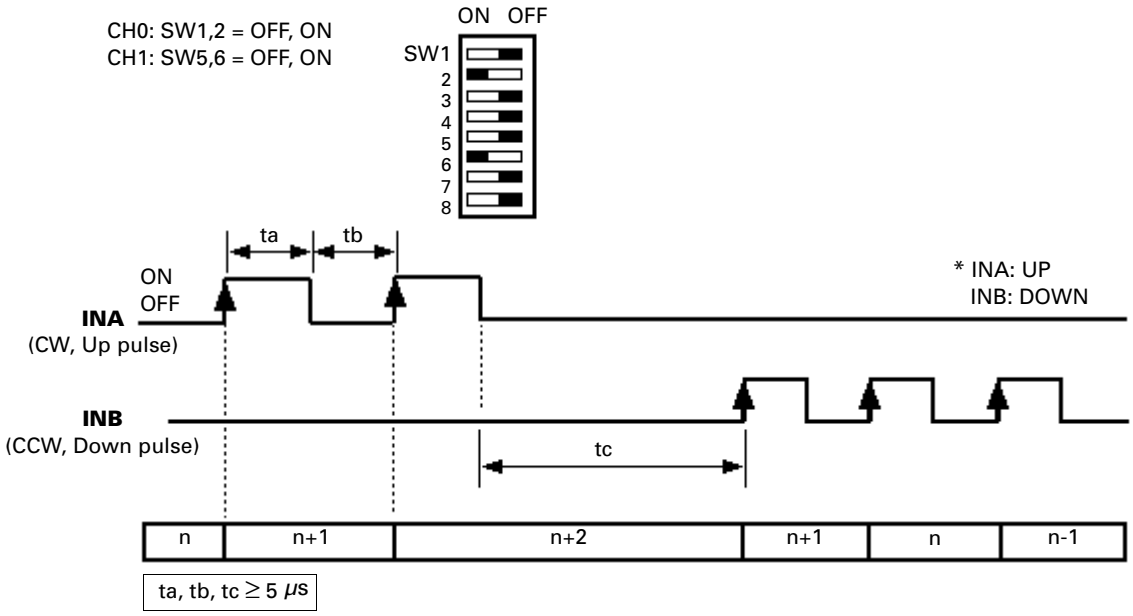
Direction discrimination input mode (Pulse + Direction)



INA	INB	Function
↑	H	Down
↓	L	Up

* H: ON
L: OPEN(OFF)

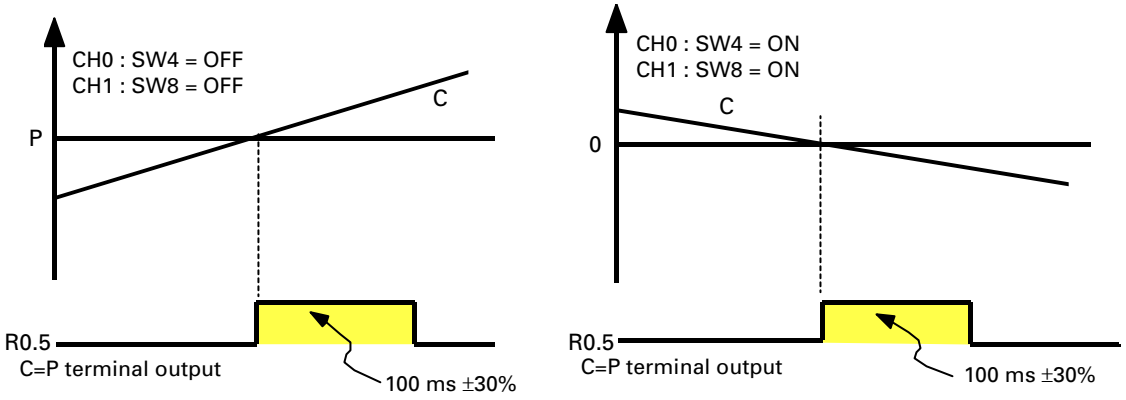
Individual input mode (CW + CCW)



Terminal block output

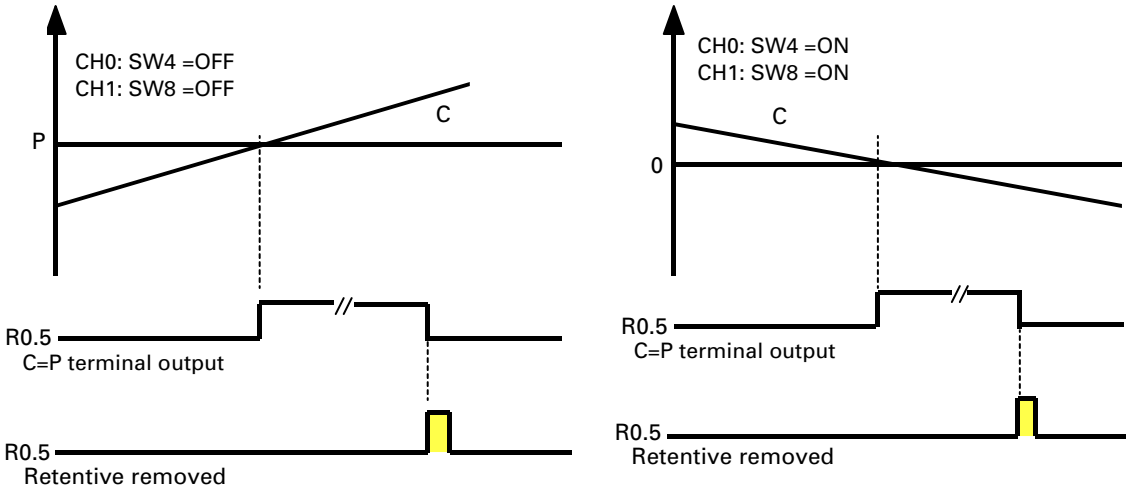
C=P Non-retnetive output

CH0: SW3=OFF
CH1: SW7=OFF



C=P Retentive output

CH0: SW3=OFF
CH1: SW7=OFF



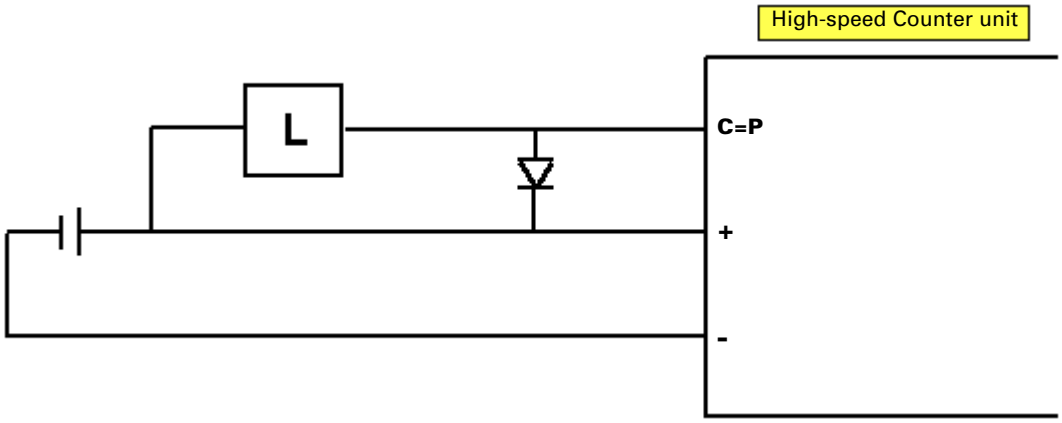
5

Precaution for Wiring

Precaution for Wiring

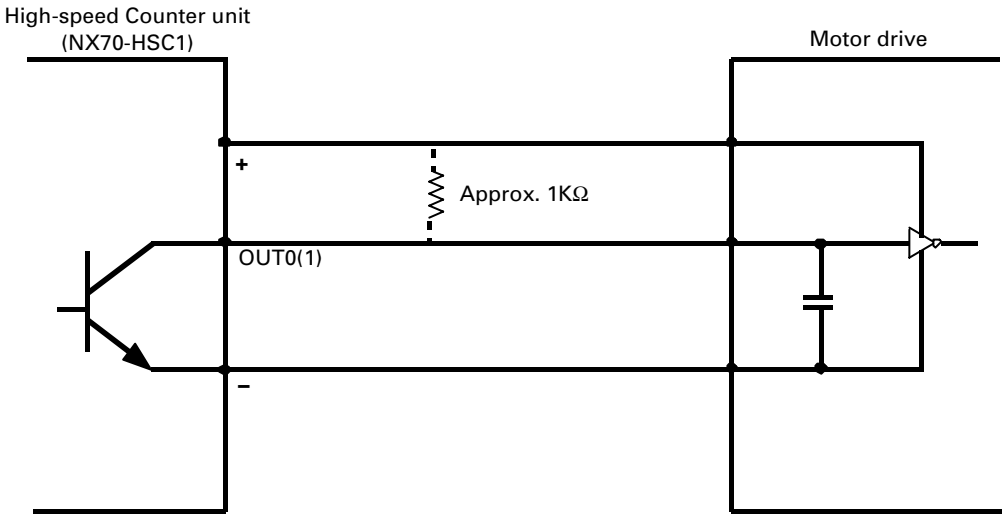
In High-speed Counter unit, the input delay time is set to 5us or less for response to high-speed input signal. Therefore, noise that occurs at input signal cable can cause error. Please read the following precautions before you use the unit.

- When connecting sensors like rotary encoder, use short cables like shield cable for input to prevent malfunction caused by noise. ("Phase differential input, 4 x" mode is recommended)
- Use protection circuit for opening and closing of induction load. Specifically, when DC induction load is opening/closing, insert reverse field absorption diode into both the ends of the load as illustrated below, to protect output cell and contact.
  In addition, when open/close induction load with transistor output (C=P, C>P), insert reverse field absorption diode. It helps prevent cell destruction.



- Pulse output is used for input to pulse motor or servo motor drive, at the same time for input pulse to High-speed Counter. Please be cautious when using parallel connection.
- When connecting to I/O unit, separate the cables from AC lines, and be careful not to overlap induced noises.
- Overlapped noise can cause error counter. The wiring from pulse output to drives (servo, stepping) is processed as the same, so use as short a cable as possible using shield cable.

- When connecting pulse output as high-speed input and connecting C=P/C>P output to external load, the noise from external power and load can affect the high-speed input and may cause error counter or motor drive malfunction.
- See Common Items for general cautions and unit mounting method.
- When elements like condenser is attached near motor drives where pulse outputs OUT0 and OUT1 are connected and the waveform shows irregularity, use resistances in parallel.



NX70 High-speed Counters (NX70-HSC1, NX70-HSC2)

OE MAX Controls

www.oemax.com

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